# COMPUTERWORLD

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## 'Virtual Memory' Pushed

# RCA Offers New Family of Four to IBM Users

MARLBORO, Mass. RCA announced a new family of computers last week in a sell-pro claimed attempt to woo small- to-medium scale users away from IBM. Called the RCA 2, 3, 6, and 7, the computers are aimed at upgrading users of the RCA Spectra/70 series and of the IBM 360/30, 40, and 50.

Two of the models, the RCA 3 and RCA 7, feature a virtual memory that RCA believes will enable it to offer the users more than IBM's new System/370 series. The RCA 3, the company said, will bring the benefits of virtual memory within the reach of the small user.

It will be difficult for users to draw comparisons of the new RCA machines with the IBM 370 until smaller models of that line are announced. The RCA 7 is the nearest in capability to the 155, although still much slower internally. Access time on the 155 is 115 nsec for 2 bytes, and 765 nsec for 4 bytes on the RCA 7. In the area of multiprogramming, however, the RCA system might show a real edge due to the availability of up to 10-million bytes of storage.

The RCA 2, 3, 6, and 7 represent, according to RCA, an advance over the current equipment that is "like IBM's — evolutionary in nature." They feature larger main memories, faster cycle times, and compatibility with the Spectra systems at the object language level and with IBM 360 DOS programs at source level.

The "virtual memories" in two of the systems make the RCA 3 and 7 particularly suitable for time-sharing applications. In keeping with company strength, all four systems seem to be strong in their adaptability to be used in a communications environment.

### Conversion Policy

RCA also introduced an innovation in the user-manufacturer relationship with the introduction of a plan whereby RCA would guarantee the successful conversion of software written for the IBM 360 to the requirements of the new RCA computers. [See Page 4]

The four new systems announced actually break down into two pairs of similar machines, one of each pair being equipped with a "virtual memory" similar to those introduced to the RCA line with the Spectra 70/46 and 61. As described by RCA, the virtual memory is a means of increasing the amount

(Continued on Page 4)

Sandra Young, RCA computer operator, monitors output on the video console of the new RCA 6 system. Behind computer operator Joyce Guglielmi is the CCM communications controller.

# NCR Point-of-Sale Retail System Meets Criteria Set by Merchants

By Michael Merritt
CW Staff Writer

NEW YORK. National Cash Register has become the latest entry in the race to convert cash registers to "point-of-sale terminals."

Designed for large department stores, the 280 terminal system features an optional OCR capability that lets it read sales tags and credit cards easily and cheaply.

The registers can operate in a standalone mode if communications fail.

A salesclerk wields NCR's fibre optic tag reader at a field trial of the 280 cash register system at Montgomery Ward in Lima, Ohio.

The main element of the 280 system is the data terminal, an electronic cash register with a minicomputer for a heart.

Based on MOS-LSI circuitry, the terminal has a 256-character ferrite core memory, as well as a visual display that instructs its operator what data to input next. It also permits visual data verification. The terminal is capable of communicating for on-line credit checks, and has three printers for sales slips, register receipts, and an internal audit journal.

The terminals in turn are connected to a data collector, basically a slow (800 bit/in.) tape drive with a communications interface. Since information is coming into the tape at a very slow rate — even with 48 terminals in use — the slow tape helps the reliability characteristics of the system.

Data is recorded in packed Ascii on 9-track NRZI compatible tape and can be read by any 9-track 800 bit/in. tape drive.

The tapes can be used for inventory control, billing, and general accounting as well as management information.

### Selling Price

The terminals sell for $3,470 and the data collector from $9,600 to $19,100. A transmission feature on the collector that allows it to go on-line to a

(Continued on Page 2)

# Legislator Seeks Curb On Federal Data Bank

CW New York Bureau

NEW YORK — A veteran of the House Special Subcommittee on the Invasions of Privacy has warned that the Federal Government is well on its way to establishing a national data bank.

Rep. Frank Horton (R-N.Y.) told the Computer Audit Systems Symposium: "Executive orders have been issued to upgrade the compatibility of various Executive Branch systems and thus all files held in the federal establishment will soon be able to be merged into a *de facto* National Data Bank," despite congressional rejection of such a system.

The Rochester lawmaker also revealed that congressional hearings had shown that in 1969 FBI and IRS agents had made 50,000 visits to credit bureau, employment agency, and insurance company data banks, "and that subpoenas were seldom required."

He noted that he had discovered that "the Internal Revenue Service was selling, at cost, a list of all gun collectors in the U.S. to direct mail firms . . . . Such a dangerous practice placed a constituent of mine in the position where he felt it necessary to erect an expensive electronic warning system around his collection of guns . . . He felt that . . . the IRS [was] selling 'a national guide to gun thieves.'"

Citing these as current examples of computer-aided invasions of privacy, Horton declared that despite constitutional guarantees, "the computer puts a wild card into record keeping and allows the invasion of pri-

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# NCR System Offers More Efficient Reading

(Continued from Page 1)

central computer costs $2,000, while the receiver costs $23,000. NCR does not currently plan to lease the system, and first deliveries should be in mid-1971.

The major option on the 280 is a new label coding system that lets the terminal operator read price, size, class and other description codes, as well as credit card numbers with one swipe of a light wand the size of a ball point pen.

The wand is connected to a reader and logic box next to the terminal by a fibre optic cord. Each reading unit costs $850.

NCR also makes the printer for the tags, and it sells for $10,450. NCR will supply the blank tags.

The coding on the tags looks similar to the color bar codes used on the sides of boxcars, but the information is carried by the alternation of three colors rather than critical width or length characteristics of the bars. The code imprinting has wide tolerances, according to NCR, and the reader will accept input speeds from one-half to 30 in./sec.

The register automatically computes such factors as sales tax and employee discounts and the constants for these calculations are programmable. The terminal can handle many different kinds of sales — cash, charge, lay-away, and so on — and several kinds of credit checks.

Though normally in constant communication with the data collector, the register can work as a standalone unit as well. When linkage is broken, a communications alert flashes and the register locks for 50 sec to let the operator know there is a foulup.

The register then unlocks and the operator continues normally. When communications are reestablished, data can be entered from the audit journal tape back into the data collector from any register.

Industry sources say that lack of this standalone feature is what doomed GE's Tradar system. With Tradar, when the central computer went down the whole store went down, a prospect not pleasing to retailers with customers waiting to spend money.

The National Retail Merchants Association is preparing specifications for register systems of this type, and they seem almost to be specs for the 280. Among the major points:

- Standalone operation.
- Adequate level of dependability (NCR estimates failure rate of the 280 as one in 20,000 hr).
- OCR journal.
- Punch tape and/or OCR output.
- Credit check capability (Option for on-line).
- Ability to accumulate totals by class and department.
- Ability to record charge, cash, C.O.D., lay-away, and other forms of purchase.
- Ability to transmit sales individually or in blocks.
- Non-detachable ticket.
- Check digit verification.

The unit has been field-tested at a Montgomery Ward store in Lima, Ohio, where, according to NCR and Ward officials, it found considerable success. Training time for operators was only about three-quarters that of regular cash registers.

The new 280 system can be intermixed with old cash registers and introduced gradually into a store.

## 280 Aimed at Large Users

For whom is the 280 financially feasible?

If a large department store with 144 registers were to convert to the 280 the cost would run like this:

| | |
|---|---|
| 144 terminals | $499,680 |
| 144 Readers | 122,400 |
| 3 Data Collectors | 57,300 |
| 2 Printers | 20,900 |
| Transmission capability | 6,000 |
| Receiver | 23,000 |
| | $729,280 |

In addition, there are education costs, as well as the cost of the user's own computer.

But the advantages include:

- Tighter inventory control.
- Faster billing.
- Sharp reduction of bad debts.
- Elimination of data entry errors.
- More precise management information.

# Legislator Warns Symposium of National Data Bank

(Continued from Page 1)

vacy on a scale never even envisioned by Adolf Hitler."

He went on to say: "Spearheaded by an information handling technology utilized without safeguards . . . dictatorship is now an operational possibility."

As first steps against the encroachment of governmental and private data banks, the lawmaker suggested two steps.

### HR 717

First, he said that the power of Congress must be balanced with that of the Executive Branch. Horton is cosponsor of House Resolution 717, which would establish a "Select Committee on Technology, Human Values, and Democratic Institutions."

Such a committee, Horton said, "could assemble the sophisticated expertise and the data to challenge and alter Executive Branch proposals. It could help restore the Congress to a coequal role; whereas now we frequently act as merely a supine ceremonial confirming body in passing legislation devised by a better informed Executive Branch."

Second, he said that the current structure of the Subcommittee on Invasions of Privacy places it under the Committee on Government Operations. The role of the parent committee is to ensure economy and efficiency in the Federal Government, while the subcommittee must frequently defy economy and efficiency for the sake of personal rights.

Establishment of a new committee would do away with this conflict of interests and provide a political power base for the fight against "technological totalitarianism."

The congressman also urged the EDP professionals to whom he spoke here last week to "implement a modern interpretation of the Fourth Amendment's guarantees [. . . in] your own organizations [by allowing . . .] the individual to have access to his own records and [by denying. . . .] access to those who can illegally harm the individual."

As well as federal data banks, Horton discussed "a totally nonregulated web of data systems growing between private credit firms and credit bureaus."

He noted, though, that the situation has improved since the first congressional investigation in 1968. "The majority of firms in the credit industry," he said, "have taken steps to improve the fairness of their operations."

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RCA

# Disappointing Attendance Marks 'Common' Meeting

By Robert L. Glass
Special to Computerworld

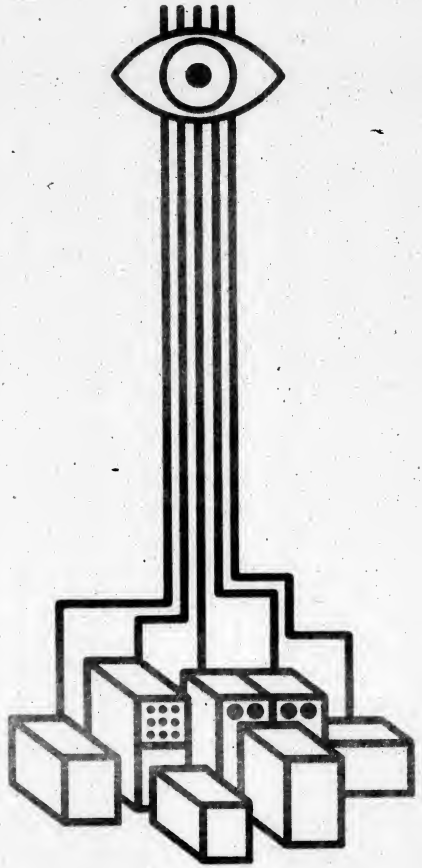
SEATTLE, Wash. — Low attendance, lingering problems from unbundling, and a host of discussions of small computer applications and problems characterized the Common user's group meeting here.

Final attendance figures at the meeting were considerably lower than at first believed. Barely 300 people registered; 400 were expected; and 500 is typical.

Surprisingly, Common members present were overwhelmingly in favor of allowing the mailing list to become available to vendors and others desiring to mail out technical literature. The Common board, aware that its mailing list had been leaked outside the organization, had been considering stringent protective and punitive measures.

As a result of unbundling, IBM is no longer accepting user-contributed programs and is phasing out distribution of them. Common is formulating plans for handling its own Contributive Program Library.

The next Common meeting will be held in Miami in December.



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# RCA Adds 'Guaranteed' Software Conversion Plan

By Don Leavitt
CW Staff Writer

MARLBORO, Mass. – RCA highlighted the evolutionary nature of its new series of mainframes by noting that the primary operating system for the real-memory models will be OS/70, announced earlier this summer [CW, July 8], and the virtual-memory models will utilize an enhanced version of TSOS-6 announced last week for the Spectra 70/46. The improved TSOS has been renamed Virtual Memory Operating System (VMOS) to reflect the new usage.

### Guaranteed Conversion

At the same time RCA added a somewhat limited "guaranteed conversion" plan to its contract.

With this option and for a fixed fee current DOS users of IBM 30s, 40s, and 50s, would be guaranteed successful conversion support to the RCA 2, 3, 6, or 7.

Under terms of the conversion program, RCA said that the programs developed would function under the Spectra 70 Disk Operating System (DOS) and/or the Tape Disk Operating System (TDOS).

The guarantee would cover only those DOS/360 programs that are in operation at the time the contract is signed, RCA said.

The company explained that if it does not substantially complete the conversion as specified in the contract, it will pay liquidated damages to the user for each day's delay, up to a maximum of 90 days.

The damages range from a fixed rate of $200/day for any unfinished programs run daily, to $50/day for any unfinished program run at random intervals by the user.

At the end of the 90-day period, and under certain other circumstances, either party may cancel the conversion agreement, and may elect to cancel the related equipment contract, without further liability.

OS/70 will utilize Assembly Language, RPG, Cobol, Ansi Cobol and Fortran IV, which are compatible with IBM software systems.

As many as 14 programs can be run concurrently under OS/70, according to RCA. The operating system includes dynamic storage allocation for both core memory and random access storage.

Integrated data base facilities are said to reduce the amount of storage required, and eliminate unnecessary duplication of data. Uniform data blocks are basic to the library system used in OS/70.

### VMOS Features

VMOS, the renamed TSOS-6, allows concurrent local and remote batch, transaction, and interactive processing. It supports Cobol, Fortran, interactive Fortran, Basic, assembly languages, as well as a desk editor and a desk calculator routine.

A data management system uses improved catalogng techniques, RCA said, and gains improved channel utilization by sorting and queuing off-line seek operations.

Interactive language processors will include a Cobol syntax checker (Cobsyn), which permits the user to detect programming errors on remote terminals such as video displays. Errors are flagged by a question mark.

If the programmer fails to identify the error, he can use the checker, which will surround the field in error with question marks.

Interactive Debugging Aids will be included for Assembly, Cobol, and Fortran programs, RCA said.

VMOS for the RCA 7 system will include a Fast Fortran and a new Interactive Cobol. The Cobol will provide conversational compilation, optimum code generation, test editing, and test data generation, the company said.

Information Processing System (IPS), another VMOS feature, will permit integration of all user data into a data base, and control accessing of the data base by multiple users.

Other features of the RCA 7 VMOS include an interrupt mechanism whereby undelivered messages are returned to the sender so that they can be reintroduced later.

RCA has two types of contracts available: a guaranteed conversion contract, and a guaranteed conversion/performance contract.

Complementing RCA's guaranteed conversion are the optional unbundling, and accrued equity contracts for users of the new series as well as the Spectra 70/46, 70/60, and 70/61.

# Peripherals Compatible With Spectra Line

By CW Technical Staff

MARLBORO, Mass. – As part of its announcement of the RCA 2, 3, 6, and 7, RCA introduced several new peripheral devices, and redesignated some units that were formerly offered with the Spectra series.

Also announced was the compatibility of the new RCA systems with the IBM 3330 disk data storage system. The 3330 was recently introduced with the IBM 370 series.

A new 320K byte/sec tape drive, the Model 8459 Tape Stations, with a speed of 200 in./sec was announced; Recording data at 1,600 bit/in. using phase-encoding techniques, the Model 8459 is said to be equal in price to the fastest units currently available.

A fully buffered impact printer, the Model 8244 High-Speed Train Printer is said to feature sharp print quality, easy-to-read horizontal alignment, and quiet operation.

A medium-speed model rated at 600 line/min was also introduced. Both printers are compatible with the new RCA computer systems and software.

Using a character set of 48 graphics, the printers have a maximum line capacity of 132 characters at six or eight line/in.

Another printer announced is an enhanced version of the Model 8740 Remote High Speed Printer, intended to be used in a communications environment. This printer provides, RCA said, remote printout at a rate of 600 line/min, more than twice the speed of previous models.

"We intend," said an RCA spokesman, "to announce in the first quarter of 1971 an RCA high-speed high-density disk storage system equivalent to the 3330."

"In the meanwhile," the spokesman continued, "we intend to support the IBM 3330 for use with our new RCA series of computers until we are able to deliver our RCA-developed units to our customers."

The bulk of the peripheral devices included in the RCA announcement were formerly available with the Spectra Series of of computers (RCA has stated that all Spectra peripherals are compatible with the new systems.) These peripheral units apparently were redesignated by replacing the "70/" prefix of the Spectra series with the single digit "8". For example, the 70/242 printer was changed to the 8242 printer.

More than 45 peripheral units, including both new and/or redesignated paper tape units, card equipment, printers, magnetic tape drives, direct access drum and disk units, magnetic card storage unit, interfaces, communications controllers, and remote terminals were included in the RCA announcement.


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# Family of Four Stresses Compatibility

*(Continued from Page 1)*

of memory available to the computer by adding an auxiliary memory (a drum, in this case) to the core memory.

The smaller pair of systems, the RCA 2 and RCA 3, is designed to attract IBM 360/30 and 40 users, RCA said. Up to 256 bytes of main memory with a cycle time of 1.4 μsec/2 bytes can be had with either system. The RCA 3 is equipped with a virtual memory drum with a total capacity of 2-million bytes.

The larger pair, the RCA 6 and RCA 7, is structured 360/50 and future 370/155 users. Main memory on both has a cycle time of 0.75 μsec/4 bytes. As much as 8-million bytes of virtual memory can be attached to the RCA 7.

The three computers are heavily communications-oriented as shown by the availability of the RCA 8660 Front End Communications Processor (FECP). This unit is based on the RCA 1600 computer which was previously used as a controller.

Heading the list of new RCA computer peripherals is the Model 8091 Video Operators Console which consists of a video display with keyboard and operational free-standing printer and card reader. The console interfaces with a CPU multiplexer channel via control electronics housed within the unit.

According to RCA, the RCA 2 offers two times the power of the present RCA computer in its class, the Spectra 70/35, and up to four times the memory at an increase in cost of less than 3% for a comparable memory size.

The RCA 3, classified as a small-medium-scale computer, is available with memory sizes ranging from 64K to 256K bytes. A typical system will rent for $15,400/mo and sell for $700,000, RCA said.

The RCA 3 is a small-to-medium scale virtual memory computer with main memory ranging from 128K to 256K bytes and up to 2 million bytes of virtual memory. A typical RCA 3 will rent for $18,900 and sell for $880,000, the firm said.

The typical configuration of the RCA 2 and 3 used by RCA consisted of 128K bytes of main memory, a typewriter console, a 1,250 line/min printer, 1,000 card/min reader, 300 card/min punch, four 60K byte/sec tape drives and four disk drives with a capacity of 120 Mbyte. In addition, the RCA 3 was equipped with a virtual memory drum, with a capacity of 512 4K-byte pages.

The RCA 6 is a medium-scale system with real memory expandable from 128K to more than 2 million bytes. A typical RCA 6 will rent for $29,300 and sell for $1,380,000, RCA said.

The RCA 7 is a medium-scale virtual memory computer with main memory ranging from 256K to 2-million bytes, and virtual memory of up to 8-million bytes. A typical system will rent for $36,000 and sell for $1,680,000, the company said.

RCA said that the typical configuration for the RCA 6 consisted of 512K bytes of main memory, a typewriter console, 1,250 line/min printer, 1,000 card/min reader, 300 card/min punch, four 120K byte/sec tape drives and two IBM 3330 disk storage units with a capacity of 200 Mbytes. The RCA 7 differed from the RCA 6 in having 256K bytes of main memory and the virtual memory device, a drum with 1,000 4K-byte page capacity.

For purposes of comparison, a similarly equipped IBM 370/155 with 512K of memory would have a rental price of approximately $35,000, according to RCA. The 370/155, of course, would not include a virtual memory.

Initial shipments of the four systems are scheduled for the third quarter of 1971.

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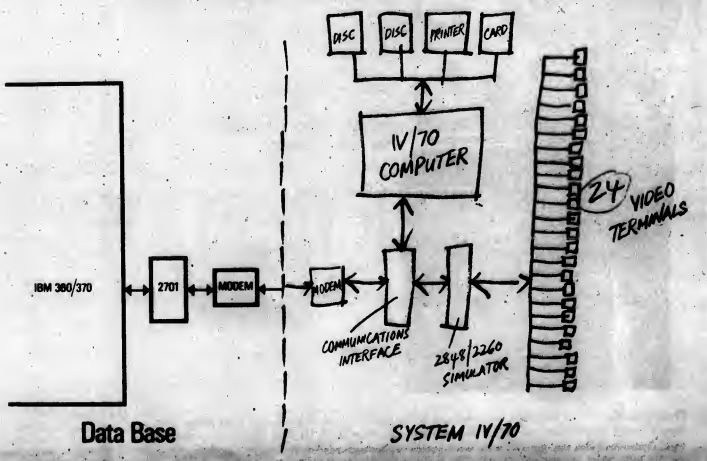
## System IV/70 is the low-cost data-base access system of the 70's

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# Bank Scheme Solved by DP Professional

EATONTOWN, N.J. – A computer expert has been credited with uncovering the recent scheme involving the alleged misapplication of $5 million from the Eatontown National Bank, causing the bank's August failure.

The facility was forced to close when the misapplication was discovered by a computer supervisor at the National State Bank of Elizabeth, which processed the Eatontown bank's checks.

The computer professional was not identified, for security reasons, although a bank official revealed that the employee worked at the National State's computer center in Linden.

It was also reported that "unusual activity" in the deposits of the Eatontown bank, including the possible recycling of cashier's checks, aroused the suspicion of the supervisor.

The employee was reportedly promoted to a vice-presidential position after the discovery, which was not computer-assisted.

Depositors were reimbursed by the Federal Deposit Insurance Corp., while the bank president is awaiting grand jury action on the misapplication charges.

# Users of Harvard's T/S Service Dismayed by Removal of Sigma 7

By a CW Staff Writer

CAMBRIDGE, Mass. – Users of Harvard University's time-sharing service have expressed "considerable dismay" at the removal of the school's XDS Sigma 7 this month.

Several factors have been blamed for the cancellation of the lease including the tardiness of the Universal Time-Sharing monitor (UTS), the XDS time-sharing package which is currently under development.

Other factors included under-utilization, a university spokesman stated.

"We're hoping that Call/360 can fill some of the users' needs, but it's premature to say what is needed" for everyone, the spokesman noted.

Some of the members of the Harvard community were rapidly developing applications for the Sigma 7, and they were "understandably disappointed," the spokesman said.

### Believed Last Years

The machine was delivered less than a year ago, with the understanding that UTS would be available this summer, a spokesman claimed. He denied, however, that undelivered UTS was the deciding factor.

Other factors included university funding for the computing center. "We just ran out of money," a spokesman commented.

Harvard has an IBM 360/65 in its computer assortment, and current plans call for implementing Call/360 on that computer.

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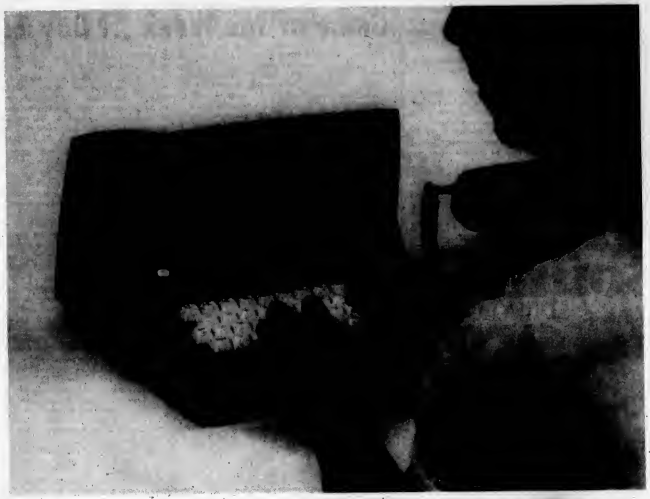

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## Keypunchers Wanted

CW Midwest Bureau

JEFFERSON CITY, Mo. — A lack of trained keypunchers who will work for $305/mo is causing headaches for the Missouri Department of Revenue, delays for the state's citizens in getting their tax refund checks, and a field day for the out-of-power opposition party.

According to published reports, Missouri still owes over 100,000 of her citizens the money they have coming as their income tax refunds.

Dave Jones, supervisor of the income tax division of the state Department of Revenue, said that his division had processed all the tax forms by June 6 and that all the returns requiring refunds had gone to the computer sections by that data.

James E. Schaffner, director of revenue, has requested an opinion from the Missouri attorney general on whether the farming out of the tax refunds would be a violation of the confidentiality of the tax returns.

The state offers a starting salary of $305/mo for trained and qualified keypunch operators.

Jones also claims that about 20% of the returns were rejected by the computer, with most of them being processed normally after being reviewed by auditors and sent back to the computers without arithmetical changes. He attributed the first rejection to keypunch errors.

# ...Now It's Time for the NFL Game of the Week...1 Day Early

By Edward J. Bride
CW Staff Writer

NEW YORK — A data base of 20,000 professional football plays provides the foundation for the latest sports application: the National Football League "Game of the Week" . . . a day early.

Not intended for prognostication, the radio project was described as "strict entertainment" by Harry Weltman, one of the originators of Javelin Sports Corp. and founder of the series.

The idea began in earnest last spring, when Javelin contracted for programming chores with Hi-Score Enterprises of Encino, Calif. The historical data was provided mostly by the NFL, stated Weltman, and was processed by an IBM 360/30 in California.

Hi-Score programmer Ed Mintz stated that every play recorded by every NFL team last year was used in preparing the program. He then added individual statistics, such as passes attempted and completed, average yardage per run, maximum gains, losses, etc.

An average of five or six random numbers was used to generate each play from the massive lookup table, Mintz stated. He also said that the random numbers are recorded so that the game can actually be audited, to prove its honesty and lack of prejudice.

Almost 1,500 test games were run before the "real" game, Mintz claimed, noting that the randomness of the plays was assured by shuffling the input cards before each game.

"We shuffle them, throw them up in the air, everybody gets a chance to cut the cards, and we let it run," the programmer commented.

### Not for Predicting

Addressing the subject of predicting the outcome of real games, Mintz said that, if people always play the way they did in the past, then there might be some justification for suggesting that the computer could predict sports contests.

He cautioned, however, that it is important to "realize that the computer is simulating statistics, not humans."

The "unusual can happen, but not the crazy" things, Mintz commented. He said, for example, that "we never force any player to do anything" by using a 100% occurrence factor. But, when the team with the ball is ahead by one point and there are only 30 seconds left in the game, "we inform a quarterback through the program that 95% of the time he'd better run."

All these possibilities, plus the scores of football rules and penalties, time-outs (including "strategic" ones for commercials) had to be considered before the game was run.

Weltman emphasized that the series was not designed to predict the outcome of the Sunday NFL games, despite the fact that the radio series is heard on Saturday in most cities.

"Chances are 50% that we're wrong on who is going to receive the opening kickoff," Weltman noted, while stressing confidence that "some of the games are going to show a pattern of play" which resembles the computer printout.

"The computer is not going to make a player who has never fumbled lose the ball four times in a game," Weltman promised, although he did concede that the human element does make this unlikelihood a possibility.

The syndicated series is heard in about 80 major cities nationwide, and will probably involve the two teams scheduled for Sunday network TV broadcasting. Javelin will decide weekly as to which games to portray, Weltman stated.

The project will continue through the football season, will include playoffs, championships, and will conclude with the "Super Bowl" game in January.

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## Research Facilities Policy Questioned

WASHINGTON, D.C. — According to Secretary of Defense, Melvin R. Laird, the government may have to revise its policy of establishing research facilities on college campuses since these projects have become potential-targets for student radicals.

A spokesman for the DoD said, however, that Laird doesn't mean the government intends to withdraw research facilities for money because of recent campus disorders.

In an entirely separate announcement, the DoD said it has decided to defer its recommendation on the installation and operation of Illiac IV, originally scheduled to be operated from a site on the University of Illinois.

# Ohio Austerity Program Could Save Taxpayers $1 Million of State Budget

By Edward J. Bride
CW Staff Writer

COLUMBUS, Ohio – Eleven different user agencies, with DP equipment from four manufacturers, are involved in an austerity program which may save Ohio taxpayers $1 million of the state's $15 million DP budget.

Various measures are bringing cost reductions ranging from $3,000 to $300,000, including one vendor's "voluntary" renegotiation of a computer contract, at a savings of $60,000.

Mainly responsible for the recent savings are state DP Coordinator Tim Terry and private consultant Norman Enger.

Terry, following the guidelines of the current "austerity campaign" in Ohio, is also following Enger's recommendations by replacing IBM peripheral equipment, issuing standard purchase documents, and developing a statewide Cobol standard.

Meanwhile, NCR "voluntarily renegotiated" a contract for three 315s, to allow the state an annual savings of $60,000, Terry stated.

On top of the list of efficiencies is the replacement of all IBM disk units and tape drives – "and printers when they come out," Terry said – with independent peripheral suppliers equipment, saving the state $300,000, or 30% of its annual lease expenditures in that area.

Much of that amount, perhaps $210,000 according to Terry, is attributed to the fact that Telex, for example, does not charge overtime for offshift use of its peripherals.

### One-Man State Survey

The disk/tape switch was recommended by Enger, who surveyed the 11 state agencies on a one-man basis. The consultant/author *(Putting MIS to Work)* also recommended development of the statewide Cobol standard, so all agencies could upgrade, change vendors, or communicate without difficulty.

Besides the $300,000 savings in the peripheral area, Terry estimated there would be a 15% to 25% throughput increase with the new equipment.

The DP administrator also hailed a new, standard Request for Proposal (RFP), which makes each element of a contract biddable, with "goal-oriented objectives," timeframe, and cost. He stated that a $600,000 consulting contract for the Department of Health was dropped to $525,000 when the vendor was asked to itemize his bid under the new RFP.

### More Measures

Other management measures taken in Ohio, as the result of Enger's recommendations, include forming an 11-man ADP advisory council, comprised of the computer managers of each of the 11 state user agencies.

The council makes policy recommendations to the director of finance, Terry's boss, and also voices opinions on standards and other related matters.

Included in the state's computer lineup are five agencies using IBM 360 equipment (three 50s, three 40s, four 30s, and one 20, Terry said). Other equipment includes RCA Spectras (two 70/65s), and the NCR 315s.


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## *Editorials*

### *Let Your Voice Be Heard*

Applications from companies seeking to offer specialized common carrier services in competition with the Bell System are pending before the Federal Communications Commission.

Under its Docket No. 18920, the FCC has invited comments from interested parties. Specifically, the commission has said:

"Based upon the applications and related pleadings before us, it appears that the questions requiring resolution in this proceeding may be stated as follows:

"Whether as a general policy the public interest would be served by permitting the entry of new carriers in the specialized communications field . . . The resolution of [this question] is obviously of threshold policy significance and, in large measure, will constitute the predicate for decisional treatment . . . The commission is deferring any determination of its own . . . until we have the benefit of the comments by interested parties . . ."

An FCC spokesman told CW that the commission is actively encouraging the public and directly affected users of data communications facilities to submit comments on the need, if any, for the new specialized carriers.

The FCC has recently given indications of welcoming and approving competition between Bell and the proposed new carriers. In a recent speech delivered to a conference on communications problems held in New York, Bernard Strassburg, chief of the FCC's Common Carrier Bureau, said:

". . . The growth of diversified demand for many kinds of data communications has introduced the requirement for equally diverse applications of communications technology. We believe that this diversity of demand can best be provided by several kinds of specialized common carriers.

"AT&T appears to disclaim that it is opposed to competition in the development of new communications services. At the same time, its position in opposition to each and every proposal . . . filed thus far with the commission leaves this disclaimer in substantial doubt. It is becoming increasingly evident that . . . AT&T cannot be all things to all people in the intercity communications field . . ."

The issue to be decided by the FCC probably will determine whether computer users will ever enjoy the benefits to be gained from having alternative communications facilities available.

The commission has asked that all responses to its Notice of Inquiry to Formulate Policy, Specialized Common Carrier Services, Docket No. 18920, be submitted by Oct. 1.

Any computer user who has experienced difficulties with existing communications facilities should welcome this opportunity to enforce the FCC's belief that competitive data networks will be in the public interest.

We urge users to respond to the question. The FCC has its ear to the ground, and it will listen.

**D.C. Data-Line**

## A Lesson for the Computer Community?

By Alan Drattell
CW Washington Bureau

WASHINGTON, D.C. – Ron Goldstein is ambivalent about computers.

The president of Restaurants Preferred (RP), a credit card operation for 17 restaurants in the District and six in Baltimore, doesn't use a computer. He'd like to, but it costs too much money and it destroys the personal touch and snob appeal that Restaurants Preferred offers its 17,000 cardholders.

RP began about eight years ago and impetus to its formation was given by some of the problems with the traditional credit cards such as American Express and Diners Club.

John Goldstein, Ron's father and proprietor of the Golden Parrot Restaurant in Northwest Washington, told about an official from Puerto Rico who had dined at his establishment. The official was also involved in American Express' Traveler Check operation in Puerto Rico.

"His bill was about $180 and when he submitted his American Express card we routinely checked our canceled card listing from Amex. His name was on it. It had to be a mistake. We billed the gentleman directly and later learned that he received a written apology from the head of American Express."

This type of embarrassment does not exist with RP, Ron explained. "All we do at Restaurants Preferred is issue a credit card to the customer. Each restaurant in the group bills individually.

The RP credit card is nothing more than an identification to the restaurant that the man's credit has been established through the central office which is manned by one bookkeeper who makes up the cards and checks the credit of cardholders.

"If the customer does not pay his bill within 45 days," Ron continued, "we send a sheet which the bookkeeper prepares to each restaurant. There's nothing cumbersome about it; she doesn't need a computer to do it. A dues arrangement from the restaurants pays for the office and the bookkeeper's salary."

Ron said that RP's "deadbeat" list of nonpayers is less than one-half of 1%. He said the national average is 1% or 1.2%. "I think we have a tighter control because we're not on a computer," he added.

Currently, RP has 6,000 to 7,000 active monthly card holders, and Ron admitted a drawback to his firm's noncomputerized approach is that customers receive separate bills from individual restaurants they've dined at rather than one composite statement each month.

But RP has looked into computers and this is what it has found: "I've sat down with Control Data Corp., Automatic Data Processing and the Riggs Bank," Ron related. "When it comes down to dollars and cents, a computer doesn't pay for us. It would give us too many reports – a ledger sheet for each restaurant, a debit and credit sheet, a delinquency chart, time all the accounts."

Goldstein's ambivalence toward computers should not be sloughed off by the computer community.

Perhaps RP's rejection of EDP is an object lesson for those of us in the computer community who smugly tell the great "unwashed" how wonderful everything will be with data processing. It would serve us well to heed the headline in an advertisement RP recently ran in Washington newspapers.

It read: "We have goof-proof computers. They're called people."

## *Letters to the Editor*

### On 4th Generation Definition

This is in response to a letter you published Sept. 9, by Morton D. Cohan, and to which you responded affirmatively.

What is the definition of "fourth generation"? I would hope that it encompasses more than microprogrammable processors and storage elements capable of simulating third generation equipment, but lacking a simple to use (simple is a word too often missing in our profession) operating system which is certainly true of most of today's reasonably priced (from the user's viewpoint) systems.

As a user we employ a computer which I would certainly call third generation. However, the software falls into my definition of fourth generation. The operating system provides the ability to run multiple jobs using dynamic memory allocation without the idiotic JCL type of restrictive languages employed by other "patched" systems.

At the same time there is complete job accounting provided to the user. The system we use is a B-3500 with its MCP package.

I have no crystal ball and cannot pretend to see very far into the future, but to all those users who would continue to play the manufacturer's game of buying on future promises I can only suggest that they look at what is available today in software as well as hardware.

How they can go on separating the two is beyond me. The trouble is, if they do look at both, they might no longer be able to justify the one or more operating system maintenance programmers currently on their staffs.

Paul I. Becker
Manager, Data Processing
Defense Systems Div.
Buker-Ramo Corp.
Wakefield Village, Calif.

## Incompetency Part of Environment?

# Parkinson, Peter, and Computer Selection Dilemma

Computer selection has always been one of the hardest tasks facing a manager. There has been something about it which seems to evade logical analysis. And yet there has always been something which can create enormous conflicts at the argument goes one way and another.

The arguments have not always been technical ones either. Personality has entered into the system, and so have politics (either the office or even the national variety).

The conflicts have been so strong that on many occasions management has decided that computers are some special breed of animal to be treated differently from anything else. In other cases management has just quietly decided the result itself, generally on a golf course, or has just given it to the faction that had the most internal political pull.

### Motives Often Doubted

If you talk to the participants of any of these battles you are inclined to find a great deal of doubt about the other fellow's honesty. The motives of many of the people involved, at least those on the other side, are often attacked. Their technical ability is denigrated, and even their business morality is directly or indirectly challenged.

Favoritism for one particular type of machine or another is often alleged to be the real reason for a selection and mere technical arguments are often brushed aside with high-sounding charges of this nature. In fact many a selection can reasonably be called a series of disqualifications rather than being an actual selection. (Remember the first round of Air Force Phase II?)

From this we can, if we want, conclude that our profession is made up of a set of self-serving rogues, time-serving technicians, and system-serving slaves.

It is not a very pretty picture, and certainly not one that would make any reasonable enterprise feel confident in our other sets of advice.

And I must admit that a good case can be made for looking at our profession in just that way. But I do not happen to believe that it is true and I think that there is some evidence to show that it is the situation of computer selection that is given rise to these problems, rather than the characteristics of the people who happen to have gone into computers.

I think that the reason we see it more in computers is because the capital expenditure of computers is often the largest single expense that most firms make that is not within their general technical confidence, and so they do not handle it well.

### Who Knows?

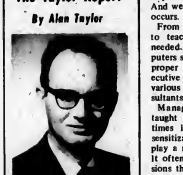
For instance, a shoe store may spend $2 million on a new shoemaking plant, but if it does there will be on the board more than one person who knows what the shoe-making plant is doing, how it does it, what its virtues are, and what its vices are.

If it buys the land to put the factory on for $300,000 there will be someone on the board who knows about buying land, who is experienced in the problem of local zoning laws, of labor pools, of transportation to markets, etc.

But when it comes to purchasing a computer for the plant, although this itself will cost half a million dollars, there is simply no one on the board able to have the necessary technical background to be able to understand

**The Taylor Report**

**By Alan Taylor**



(and refute where necessary) the technical arguments that are placed forward by the different vendors.

### Parkinson Effect

This has long been known, and has often been lamented. The key discussion of the problem occurs with C. Northcote Parkinson's books.

In his description of the amount of time taken on various types of subjects in a board meeting, he points out that the problem of providing suitable parking facilities for the employees will get a lot more time, and a lot more individual attention from the directors than would a proposal to adopt a particular type of nuclear power station.

For our purposes the relationship between the quickly dismissed technical discussion about the nuclear power station is a clear parallel with the problem of which type of computer to obtain.

In both cases the actual discussion and decision is a highly technical one. In both cases the board has little experience with dealing with such technical matters. In both cases it is one in which the technicians are often completely divided so that each set of technical advice is reasonably suspected to be mere rationalization of a decision that has been taken for a different purpose or on some different grounds.

And in both cases the amount of money involved is so large that it is obvious that it must come to the board for approval.

### Board Must Act

Moreover, and here is the real point, in both cases the benefits that can be promised to the firm from both sides of the discussion are so large that the board has no real alternative but to press forward on one or another route, *even though that route has not been properly documented or proved to be the best.*

Therein lies the dilemma. All sides will often agree that the benefits from having a computer, any computer, are so great that a computer is going to be obtained.

Yet neither side often wins the argument clearly on technical grounds that could be appreciated by management or, for that matter, other technicians. The board is left without proper data on which to act, and yet must move. Then when it does so, its reasoning is vulnerable to Monday morning quarterbacking! And we all know how often this occurs.

From this situation arose a call to teach management what it needed to know about computers so that it could make the proper decision. Luxurious executive courses were put on by various vendor firms and consultants.

Management was sometimes taught binary code, and sometimes in a type of group of sensitization theory made to play a role in simulation games. It often emerged from such sessions thoroughly convinced that its teachers knew all that anyone needed to know about computers and with a telephone number to ring when it needed an answer in the future.

To some extent that may be all that management needs to know but really it does not help very much and the telephone number is really merely that of one of the computer vendors. All this did was to influence the line-up of non-technical argument, not improve the quality of technical decision making. In short, it did not help much.

### Best-Seller Field

A more productive method is to stay in the best-seller field. Parkinson had been considering the life cycles of various departments and other corporate identities in his considerations and had only considered the role or people within the department as an incidental, and as a way to bring his arguments home to us.

On the other hand, the Peter Principle was much more concerned about the individual himself and how he could survive in the office jungle. The prime thrust of his argument was that anyone who is competent in his job will get promoted to a level in which he is incompetent.

This was not put forward with any great moralistic regrets. It was merely noted as a fact which occurs, rather like the way that someone might note how often it rains on weekends. And naturally various strategies were

Alan Taylor, consultant, writer, and former editor of *Computerworld*, is president of Computer Management Aids Corp. of Framingham, Mass.

brought forward to deal with the situation.

The idea of an incompetency level, however, was totally a new one, and yet it may well be exactly the reason that Parkinson found that the board was not prepared to give serious discussion to the problem of selecting a nuclear power station.

The decision on the matter had risen beyond its competency level, and into the incompetency area. If was the environment of the decision point – not the competence of the technical level, that was causing the problem.

Similarly this would indicate that many computer decisions, selection decisions in particular, must also rise to an incompetency area. This, rather than any fault that lies in the characters or technical abilities of the personnel involved, is probably the basic reason why there are so many, and such ill-mannered computer selection fights.

There are many ways in which the selection can reach an incompetent area. One of the normal ones is by simple appeal. If there are two vendors who are fighting for a multimillion dollar order, then they will have already spent some tens of thousands of dollars trying to get the order by the time they are turned down. What is more natural for them to appeal the decision?

It does not cost very much to make another approach, and there are not any future relationships – for another five years which will tend to let this one pass by for fear of antagonizing the technical departments. So, naturally, appeals will be made – and can go right up to the final, incompetent area.

So it appears as though there is some evidence which suggests that incompetency is part of the computer selection environment, and that this fact has been totally neglected in our discussions to date. (Which rather leaves them wanting.)

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# L.A. Turns to Research Firm To Clear Up Vote-Counting Flap

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES – Los Angeles County, for two years plagued by problems with computerized vote counting, is trying a new approach to see whether it can learn how to use the system without chaos, damage to the vote, lawsuits, and delays.

At the recommendation of the latest investigating blue ribbon committee, Los Angeles hired Electronic Research Assoc. (ERA), a systems analysis firm, which prepared a report detailing what went wrong in the June primary vote, to implement the capabilities of the county offices by preparing a master plan for running the November election.

### CPM Method

ERA is developing procedures and responsibilities by using the Critical Path Method (CPM) charting to aid in getting all the details dovetailed at the right times.

One of the points of contention has been that the political parties did not know the physical or procedural layout well enough to have observers at all places where they should be, nor was there a briefing so that all observers present knew what it was they were observing.

### Increased Security

The ERA recommendations include increased security, protection for the programs. Although this was also part of the recommendation of an earlier blue ribbon committee, it found that security had not been implemented.

The recommendations include the following:

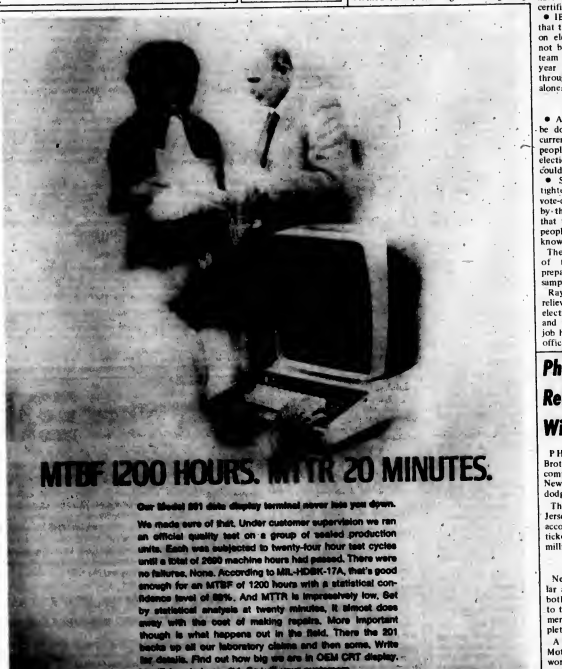
- All vote counting programs should have complete audit and should then be certified.
- IBM should also be asked to certify that the computer operating systems used on election night are standard and have not been tampered with in any way. (A team that played vote rigging games last year found that rigging could be done through use of the operating system alone.)

### Document Procedures

- All procedures for an election should be documented. This is not being done currently and as a result, if a few key people are unavailable for the November election a major breakdown in the system could result.
- Security requirements should be tightened for those having access to the vote-counting area. One of the complaints by the observers at the last election was that there was not adequate checking of people entering the area and they did not know all the people or their business.

The 100-page report covers every step of the November election including preparing the voter lists and mailing sample ballots.

Ray F. Lee, county recorder, has been relieved of top responsibility for the election at the recommendation of ERA and the blue ribbon committee, and the job has been given to chief administrative officer L. S. Hollinger.



# Philadelphia May Get Relief From N.J. With Ticket 'Dodges'

PHILADELPHIA – The City of Brotherly Love has been promised some computerized assistance from the state of New Jersey in pursuing traffic-ticket dodgers.

There are approximately 200,000 New Jersey parking violators a year here, according to legal sources, and if all tickets are paid, it would mean $1.2 million for the city.

### N.Y. Arrangement

New Jersey recently worked out a similar arrangement with New York City. In both cases, license numbers will be input to the New Jersey Motor Vehicle Department computer, which will provide complete information on the cars' owners.

A New Jersey spokesman said that the Motor Vehicle Department is willing to work similar arrangements with other municipalities.

Philadelphia formerly bought such names from the R. F. Co. at 25 cents a head. The contract expired last summer, and then New Jersey reversed a previous policy whereby the state would only provide three names on each request.

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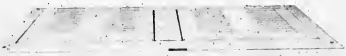

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# Just Milking Cows for All They're Worth

CW West Coast Bureau

DAVIS, Calif. – It takes 400 to 500 linear simultaneous differential equations to simulate a cow in a computer, and what you can do with those equations is search for answers as to why some animals are hetter milk producers than others.

The goal is to seek better production in all cows.

This work is being done at the University of California at Davis, Animal Sciences Department. It takes 30 minutes to run through the equations on a Burroughs B5500 unless they simulate over feeding or under feeding the animal, or some other special case, in which it then takes as much as one and one-half hours.

All of this is to reproduce one day in the life of a cow, according to Prof. R.L. Baldwin of Davis.

Data was previously evaluated in pieces, and now can be centralized in one place and comparisons run to see what is still unknown. The department has been collecting data on cows for six years but it has never before been able to fully utilize it, or to pinpoint where more information is needed.

"Some animals are more efficient converters of food stuffs to milk than others. If we can find out why, then we can increase the production of all cows," Baldwin said.

### Operated on 2 Levels

The computer program is operated on two levels. There are detailed equations for every function such as the mammary glands and tissue functions. While these will number several hundred equations, they are refined to about 50 equations which go into the model of the whole animal. Each equation represents a special process in the animal such as digestive, heart and liver, hlood circulation, fat storage, etc.

The computer language used is one developed by the University of Pittsburgh and is distrihuted by IBM in machine-independent Fortran. Baldwin said he had to convert only a half a dozen or so statements to put it on the Burroughs machine.

# Senate to Meet On Data Banks

WASHINGTON, D.C. – Government computer data banks will come under scrutiny in the Senate when the Constitutional Rights Subcommittee of Sen. Sam J. Ervin (D-N.C.) holds hearings Oct. 6-8.

Ervin has been a frequent and vociferous critic of governmental snooping into the private affairs of individuals, but until now he has been primarily concerned with invasion of federal employee's personal affairs.

### Personality Testing

Publicity from past Ervin hearings has been enough to limit personality testing of prospective federal employees and to reduce pressure on government employees to buy bonds.

The October hearings, the first in a series, will take particular aim at Army data banks [CW, Sept. 2].


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# 'Jobol' Precompiler From CUC Stresses System Design

By Don Leavitt
CW Staff Writer

TOWSON, Md. – Built around the "ounce of prevention" premise, the Jobol system, from Computer Usage Co. (CUC), is a precompiler that couples system design capabilities with coding shorthand and system-generated I/O instructions to produce Cobol source programs for 360 users.

A company spokesman noted that other precompiler systems have included debugging aids for working with the programs after they have been coded and compiled. The Jobol design aids should eliminate most of the problems before they get into the programs, he added.

**Three-Part System**

The three-part system includes Jobol-I, II and III.

Jobol-I is primarily a systems tool with which the analyst can determine the best of several file designs, including blocking factors, before coding begins.

Jobol-II also starts as a systems support package, printing proposed report layouts for confirmation of design, before coding is generated.

The second phase of Jobol-II is the precompiler itself, which uses coding generated by the earlier sections of Jobol and problem logic coded by the programmer, to output program listings and source level card decks.

Jobol-III is a library package with which the files can be modified after they have been cataloged.

To use Jobol-I, the analyst describes the proposed file design in free-form shorthand. This is expanded by the system into Data Division FD and record description entries, and a tabular picture of the records, including the slack bytes generated for proper boundary alignment.

The system also generates a table of possible blocking factors for disk files, noting the number of bytes that would be lost with various patterns.

Once he has determined the optimum design, the analyst reruns Jobol-I to catalog the file design and to generate the I/O coding needed by the program to handle the file.

In a similar vein, possible formats – including headings, references to data fields from the file defined in Jobol-I, and total handling – can be put into Jobol-II, and the system documents the proposals so that they can be evaluated.

This system, CUC notes, lets the user see what a report will look like as computer output, as contrasted with the not-too-clear picture provided by a printer-layout sheet. It will also generate the coding to produce the report that is finally chosen.

Under Jobol, the Identification, Environment and Data Divisions are generated by control cards. The Procedure Division is coded using either standard Cobol or Jobol-acceptable abbreviations. The I/O coding generated by Jobol-I and the report-development phase of Jobol-II, is invoked through what CUC calls Available Verb Options (AVO). These generate PERFORM statements that access the appropriate coding.

**Full Cobol**

The program listing from Jobol-II expands all the abbreviated coding into full Cobol, with proper punctuation. The listing also shows the origin of each statement, whether "user" or Jobol, for debugging purposes. The punched card source deck omits this cross-reference, but includes a standard program-id.

The Jobol system requires 32K storage to function under DOS/360, or 22K (exclusive of supervisor) under OS/360. Under DOS, it requires the Commerical Instruction Set.

The DOS version is priced at $10,000, while the OS version costs $15,000.

The Computer Usage Co. branch that is handling Jobol is at 22 West Road.

# Sevan Service Forecasts Profit on Housing Plans

FAIR LAWN, N.J. – Urban renewal authorities and private real estate developers can use a simulation service, available from the Sevan Computer Services, Inc., to determine whether proposed projects are financially sound.

According to Sevan, the user defines the proposed numbers and types of dwelling units, development location, anticipated cost and desired return.

From this, Sevan said it can develop any of six reports, dealing with design, zoning, statistics, analysis of expected return, government schedules, or discounted cash flow.

Based on these original printouts, the user can modify any of the factors and receive new reports.

Although the service is designed primarily for larger projects, Sevan said that it had been used for one valued at only $80,000. In that case, the company said, the documentation was instrumental in the developer securing a loan for the project.

Loading the model and producing the first reports, assuming all are wanted, will cost $500, a spokesman estimated.

Sevan Computer Services is on Pollist Drive South.

# System Simulates CPU Problems

Special to Computerworld

SEATTLE – A software system designed to avoid some of the pitfalls of preinstallation computer simulation has been developed at Stanford University.

The system was described recently at a meeting of the Boeing Scientific Research Laboratories, here, by Prof. Norman R. Neilsen of the university.

Intended for use by either the computer vendor or user, the system, called ECSS (Extendable Computer System Simulator), is said to combine power to solve problems specifically related to computer simulation, with versatility, to avoid being tied to one particular CPU to process the simulation.

Neilsen, of Stanford's Department of Operations and Systems Analysis, heads a team that has developed the ECSS system. Their project, he said, contains power in the number of language forms available for defining and manipulating computing system facilities; and versatility in the fact that the system is based on Simscript II, a general-purpose simulation language that has been adpated to a number of processors.

Implementation of ECSS consists of a translator, which converts ECSS statements into Simscript, and a comprehensive library of computer simulation building blocks. The system is coded in Simscript, and that is portable across machine lines (to the extent that Simscript is).

The user may code in both ECSS and Simscript, depending on the requirements of his task.

ECSS, Neilsen caretully pointed out, does not aid in the difficult and vital work of gathering the data required to describe the system being simulated. It will, however, speed up the process of building simulators once the data has been acquired.

Neilsen has been associated with several previous simulation projects: IBM 360/67, Burroughs B6500, and Illiac IV. The ECSS translator is currently working and the library of building blocks is being checked out.

# 1130 Users Gaining Software Support Including Utility, Business Packages

Users of the 1130 can look to several sources across the country for both utility and application software support.

Computer Systems Laboratories (CSL) of Red Bank, N.J., has a sort package said to be both fast and flexible in the types of files it can process.

DNA Systems of Flint, Mich., has roll-in/roll-out routines that allow the user to interrupt a job in process and to return to it after the interruption.

Larry Smith & Co., San Francisco, has developed a seven-part accounting package including payroll, general ledger, and accounts payable and receivable modules.

Written in Assembly Language to optimize sort speed, the CSL package can sort files generated by Fortran, RPG or BAL. The company added that the output can be in ascending, descending or mixed sequence, and can be stored in place or on another file. The sort key can be made up of characters, packed or unpacked decimal digits, single- and double-word integers, and standard- and extended-precision floating point, a spokesman noted.

**Interruption**

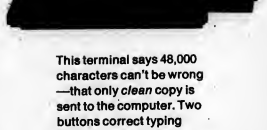
The DNA routines allow for interruption of an on-going program through either operator intervention or program control. The "rotlo" routine rolls core out to a save area on disk on an external interrupt, and rolls it back to memory for execution after the interrupting function has been completed. "Spec" has the same capabilities but under program control. Speed is CALLed by the program to be interrupted.

The Smith Accounting Package is modular, and written in Fortran IV with IBM's Commercial Subroutine System for computations and print control. Beyond the classic accounting functions, the package includes a revenue and expense report generator, and a time and cost analysis module. The basic programming was designed for a single-disk 8K 1130. Smith noted that the package can be adapted to the 360 or any other CPU with a Fortran compiler.

Smith, at One Maritime Plaza in San Francisco, has priced its package at $20,000, which includes source deck cards, documentation, manuals, and instructions and forms for initializing data files. Installation assistance is available at additional cost, the company said.

The DNA routines are available at $225 for both, or $150 spiece if sold separately. DNA Systems Inc. is at 2415 W. Stewart Ave., Flint, Mich.

The Computer Systems Laboratories are at 176 Riverside Ave., Red Bank, N.J. The Sort/1130 is available through a license agreement at a cost of $575 per installation.



This terminal says 48,000 characters can't be wrong —that only *clean* copy is sent to the computer. Two buttons correct typing errors — one by the character, one by the line — before the data is recorded on tape. It's the 5-50.

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*Bill Farrell, whom Bill Goodfellow replaces, has left Computerworld to enter Law School at the University of Arizona*

*Good luck, Bill*

# Fixed Asset Reports Save Auditing Time

DALLAS – Managers can maintain a perpetual inventory of the physical equipment of a company and/or its affiliates, by using the Fixed Assets Control System (Facs) from Management Systems Corp. (MSC).

The report from the system, which operates under DOS/360, shows function and type of equipment, owner and physical location, as well as choice of depreciation method and depreciation schedule. They also include lease records and history of all leased equipment, MSC said.

MSC noted that the reports could be particularly useful during the annual audit of a corporation's accounts.

The master file from which reports are developed is on tape and is updated through entries on MSC-provided "Data Sheets." The system consists of 14 programs and has been implemented on a 32K 360/30 with four tapes, a card reader and a printer, MSC said.

Since Facs is written in Cobol, it could be adapted to other processors that support Cobol, MSC said.

Facs is available for $4,500 which includes installation, documentation, systems seminars and training sessions for the operating personnel.

Management Systems Corp is at 7007 Preston Road.

# Tape or Disk Files Can Be Created By Control Cards With Filegen

SILVER SPRING, Md. – Fortran-oriented installations can use the Filegen package from System Automation Corp. (SAC), to generate 7- or 9-channel magnetic tape, or disk, files from a series of control cards.

According to SAC, Filegen can generate fixed or variable length records, blocked or unblocked, and multireel files or multifile reels.

Filegen can also be set up as Callable subroutines to be used with Fortran or Asembly Language programs, for reading and writing files. SAC said that Filegen requires about 4K of storage in addition to buffers for the I/O files. If buffer size is not supplied, a default option assumes 2,000 bytes for each.

The company said, however, that test data generation is the prime use of Filegen, since the available commands allow the package to create the test records in just the sequence and including exactly the data desired for a specified test.

Currently implemented on the CDC 3000 and 6000 series, Filegen is written in Fortran and is being adapted for use on other processors, including the 360.

Filegen is available for a one-time charge of $950.

System Automation Corp. is at 2426 Linden Lane.


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# Graphics Terminal Has Good Price/Performance Ratio

By Frank Piasta
CW Staff Writer

CANOGA PARK, Calif. — A low-cost interactive graphics terminal from Vector General can communicate with minicomputers as if it were a high-speed peripheral.

Vector General's New 21-in. display, Interactive Graphic Terminal

The interactive graphics terminal offers, according to Stewart C. Brown, company president, a high price/performance ratio in comparison with other graphics terminals currently on the market.

An interactive terminal allows the operator to change and modify pictures on the display; and, in doing so, automatically enter new information to the computer that is driving the system. The computer is used to analyze the operator-induced changes and display the results.

In addition to cost, Vector General states that its terminal represents a significant breakthrough in picture quality. Proprietary vector- and character-generation methods allow endmatching of vectors to within .02-in. and a standard drawing rate of 2.5 μsec/in., the company said. Alphanumeric and special characters are drawn using curved instead of straight-line segments to improve legibility.

The cost reduction has been achieved by designing the terminal as a high-speed computer peripheral rather than as a terminal with an integral computer.

Currently, interfaces are available to adapt the terminal to several minicomputers. These include: Hewlett-Packard 2114B, 2115A, and 2116B; Redcor RC 70, and RC 77; Varian 620/i; CDC 1700; and the Digital Scientific Meta-Four. Interfaces for other minis are being developed, the firm said.

The Vector General graphics terminal uses one data channel (DMA), one programmed I/O channel and one interrupt channel of the host computer.

The terminal's display controller has its own instruction set and interrupt structure. It handles all interactive devices and display processing, the company said. Standard design features include hardware scissoring, 16 intensity levels, autoincrementing, a variety of line-drawing modes, and transformation of characters as well as vectors.

The terminal uses the computer memory for refresh and can generate 7,000 vectors at 30 frame/sec, and the extended Ascii character set plus special characters at an average rate of 10 μsec/char.

The basic terminal comes equipped with a 17-in. CRT display/controller with computer interface, vector generator, and coordinate transformation hardware providing up to a 3-dimensional display.

Options include a character generator, light pen, function switches, keyboard, joystick, data tablet, control dials, A/D converter with multiplexer, 21-in. CRT, and a 1.5 μsec/in. drawing rate.

The basic configuration of the Vector General Interactive graphics terminal is priced at $19,800. It is currently available 90-days ARO.

Vector General is at 8399 Topanga Canyon Blvd.

# Mini-Based Ultimacc Accounting System Intended for Use by Small Businesses

EDGEWATER, N.J. — A minicomputer-equipped accounting system is said by the manufacturer, Automated Information Systems, Inc. (AIS), to perform all of the office accounting functions for a small business.

The Ultimacc comprises a 30 char/sec accounting-oriented keyboard printer with a split-platen, front-form feed, and direct tabbing; a Nova minicomputer with a basic 4K 16-bit words of core storage and 1K words of ROM; and a modified 4-tape Cartri-File to serve as auxiliary storage. Each tape has a capacity of 52K words.

The system includes preprogrammed software stored on magnetic tape cartridges, making it into a turnkey system, According to AIS, any clerical worker will be capable of operating the equipment successfully with as little as three days of training.

The split-platen printer is said to be particularly suited to accounting operations. It can print three forms simultaneously; a 6-part invoice set, a ledger card and a sales journal can all be handled at the same time.

Concurrently with the typing of an invoice, the sales journal will be updated as will the customer's ledger card. The system also maintains a cash receipts journal and enters credits on the customer's ledger card showing the receipt.

Ultimacc can handle, according to the company, accounts receivable, accounts payable, inventory stock status and, general ledger bookkeeping. A payroll system is under development. Such management information as sales analyses and cash position statements are generated as a byproduct of the system.

Other functions of the system include daily trial balance and monthly statements. Sales reports for the last 13 months and salesmen's commission reports can be generated. Summary reports, based on the general ledger, such as balance sheet, statement of income, and profit and loss, can also be prepared.

The "power-typing" and editing features allow the use of the Ultimacc as an automatic typewriter to prepare personally addressed copies of form letters.

The Ultimacc is available on a four-year lease with full buyback for $1,200/mo. A five-year lease with 10% buyback is priced at $850/mo. The system can be purchased for $42,500.

Maintenance costs are not included in the purchase or the lease prices. It will be provided on a nationwide basis by Honeywell, according to AIS, at an estimated cost of $15/mo.

First shipments of the Ultimacc are scheduled for Nov. 1, 1970. It will be available 90 days ARO thereafter.

Automated Information Systems, Inc. is at 1064 River Road.

# Chain Printer 1130 Compatible

CAMBRIDGE, Mass. — A chain printer that is compatible with the IBM 1130 and said to provide higher performance at lower cost than the 1403 printer has been developed by Intercomp.

Called the 1130/Sprint, the 400 line/min. printer connects directly to the 1130's 7490 SAC (Storage Access Channel) eliminating the multiplexer (1133) needed by the 1403.

The 1130/Sprint is said to be easier to operate than the IBM printer. Its ribbon is contained in a cartridge, making ribbon changing much quicker and neater. The chain cartridge is also said to be easier to replace than its IBM counterpart.

The standard print chain uses a 48-character set similar to the IBM HN chain. A 96-character set that allows upper and lower case printing is optional. Standard line width is 120 characters. An optional line width of 136 characters is available. Line spacing is either six or eight line/in. and carriage control is through a 12-channel, IBM-compatible tape.

The 1130/Sprint is being marketed by Vendere Intercontinental Marketing Corp., Del Amo Financial Center, Torrance, Calif. Maintenance is provided by the Raytheon Service Company.

The 1130/Sprint is priced at $795/mo on a two-year lease. Purchase price of the printer is $24,800. Maintenance charges are $150/mo.

Intercomp is at 243 Vassar St.

# Tape Cassette Equipped Terminal Compatible With TTY Equipment

ROCHESTER, N.Y. — A tape cassette equipped communications terminal from Technical Concepts, Inc. is compatible with Teletype equipment.

Called the Model 4100 the terminal is said to be unique in incorporating both an incremental interface for slow-speed operator-oriented output and a selectable speed asynchronous interface for high speed transmission to the communications line.

The unit includes station-keeping capability for regulation of the interfaces, which are designed to operate separately or simultaneously. The self-contained, portable unit is claimed to be the first low-priced terminal that can function both as an autonomous batch processing station and as an operator-oriented storage and station control unit.

The base price of the 4100 is $1,650. Delivery is 30 days ARO.

Technical Concepts is at 580 Jefferson Road.

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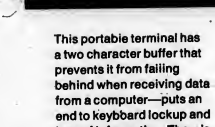

This portable terminal has a two character buffer that prevents it from failing behind when receiving data from a computer—puts an end to keybard lockup and loss of information. There's nothing else like it, the Novar 5-41.

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**The Inforex system** gathers data from eight keyboards into one disc memory unit. Data may be sight or key verified. Built-in logic performs check digits, left-zeros and balance totalling. Jobs are pooled onto 7 or 9-track compatible tape. Optionally, it will operate on-line directly to your central processor.

**Keypunch/verifier functions.** Starting with the familiar 64-character keyboard, each Inforex keystation performs all keypunch and verifier functions: Automatic check-digit computation. Automatic left zeros. No digit by digit keying is necessary. Electronic skipping and duplicating rather than mechanical. Auxiliary duplication or two additional levels of program control. Automatic + or − signing of fields.

**Simultaneous entry and verification.** All eight keystations input to one disc memory unit. Each keystation is assigned an area as it enters. Any keystation can access any assigned area at any time.

Since each keystation has both sight and key verification capability, one keystation can verify work entered on another and if desired, verification can be done simultaneously with data entry.

**Keyboard to tape functions.** Inforex automatically pools input from up to eight keystations onto 7 or 9-track compatible tape. One easily entered statement transfers a series of batches. Only one keystation is required to initiate the transfer, and all keystations are functional during transfer. There are no cartridges to handle or identify, no special equipment needed for pooling.

**Recallable programs.** Each program has four levels of control. Once the program is keyed, it can be stored for future use and recalled by any operator merely by keying its appropriate program name. Up to 128 different program controls can be stored. There's no program card or tape mounting and no repetitive program control keying.

**Self-balancing.** Zero balancing is an integral part of the Inforex system. Each operator may accumulate a control total during data entry. Edit controls allow rapid correction. Adjustments to the balance total occur automatically during verification.

**125-character records.** With Inforex Intelligent Key Entry, the record length is variable up to 125 characters.

**Full record display.** For added accuracy, each keystation displays an entire 125-character record with moving cursor and position counter. The system has a forms capability that allows data entry and verification in a "fill-in-the-blank" fashion. Operator messages for direct interaction with the system along with search and paging of a file are standard.

**Attractive office decor.** Inforex design innovation doesn't stop with the components. Each Inforex keystation is built into an attractive contemporary walnut and black steel desk designed for operator ease and comfort. And remember, the system is electronic, not mechanical, allowing a quiet, comfortable atmosphere to work in.

**Inforex monthly rental cost is $50 per keystation. $560 for control unit (up to 8 keystations). $960 for a complete 8 keystation system, including maintenance.**

Inforex, Inc., 21 North Avenue, Burlington, Mass. 01803 or, Inforex AG, Dornacherstrasse 210, Basel, Switzerland.

# "Inforex it."

## Keypunch Replacements—Part V

# Keyboard-to-Computer Systems Deliver 'Cleaner' Data

By H. Edward White
Special to Computerworld

Large keypunch installations, of at least 16 machines, may very well profit by replacement with a keyboard-to-computer system.

The objective of any keypunch unit is to provide data which will be "clean" for entry into the initial computer processing run. Since keypunch and verify machines have no balancing, counting, or validity checking capability an edit run is often needed before true processing can be done. This requires expensive "big" computer time, and serves to slow throughput.

Eight companies believe that they can deliver complete "clean data" capability without costly mainframe time – and do it faster! They are Computer Machinery Corp., Consolidated Computer Services, Ltd. (KeyEdit), Cybernetics International (Realtronics), General Computer Systems, Honeywell (Keyplex), Logic Corp., Penta Computer Associates (KeyLogic), and Systems Engineering Laboratories (KeyTran).

What can these systems do for you? Let's take a look at how they work. First, they store all of your programs on a disk or drum. Your operator simply "calls" for the required program – no programs to key or load.

### Disk or Drum

All keyed data is recorded onto a disk or drum so that it can easily be called back later for verification. Incidently, verification can be simultaneous with recording, either with the same operator or a different one. These systems have controls for spreading a large volume of work among many operators, maximizing throughput.

Will they help us to reduce verification? They have logic to check data recording as it is taking place, compute balance totals, crossfoot records, count records, check the "range" for variable fields, check length and content of fields, and compute and self-check digit. With all of these controls and checks available, systems planners have new "tools" to use for insuring data accuracy without costly key verification.

The systems keep track of what each operator is doing. Through a supervisory console, it is possible to assign work to an operator, or to obtain statistics about her progress on a job. Error data, by job, and by operator can be gathered.

After the supervisor has determined that a job is complete, it is transferred to tape in batch sequence, even though several different operators may have worked on recording and verifying. It is a "clean" tape, "unblocked" to maximize computer speed!

General Computer Systems has a system that truly concentrates on reducing the labor required for verification. Each record prints on a strip printer.

A verify station is designed to place the source document in close proximity to the moving "strip" of data to be sight verified (the speed is controlled by the operator using a footpedal). The manufacturer claims two to four times the speed of key verification!

### Adding Machine

General Computer also offers an adding machine and a typewriter keyboard configuration in addition to the conventional keypunch format.

Computer Machinery Corp. offers batch verification. If a batch is out of balance, the system will "keep track" of changes in the balance total as the batch is verified and corrected. When a "zero balance" occurs, you can stop verifying!

Realtronics has an extraordinarily simple station. The display consists of two Nixie tubes that provide all needed displays, including instructions for needed corrections.

KeyEdit uses a drum instead of a disk for the initial data recording; the faster access time can be useful when simultaneously recording and verifying.

Would you prefer to load data onto your computer using a disk instead of tape? It's standard with Logic Corp. (in addition to tape), and optional with the others.

What about cost? You can breakeven with key-to-tape systems at about 14 to 16 stations. The value of reduced verification, reduced computer time for editing, and faster throughput is the real "paydirt." The systems can have as many as 64 stations on-line At this volume, the cost per station is the lowest of any system.

The same problem of "catastrophic" downtime exists here as with the group discussed last week – if the central processor goes down, up to 64 operators can be out of work. Consider "dualing" the central processor. Believe it or not, you can still breakeven at about 20 to 22 stations – and enjoy the benefits of a preprocessing computer literally for free!

Next week, we'll discuss whether keypunch replacements will really replace keypunches.

*H. Edward White has been an independent data processing consultant for the past seven years. He has had extensive experience with data recording and communications equipment, and is currently manager for corporate planning at I/O Com Inc.*

*During the past two years over 30 companies have developed keyboard-type data recording devices designed to replace keypunch equipment. Apparently these companies believe that many of the estimated 400,000 keypunch and verify devices installed in this country will be replaced by their equipment.*

*But how valuable are these new devices to the keypunch user? Are they cost effective? Do they increase efficiency?*

*In this series CW explores the advantages and disadvantages of the keypunch replacement devices.*

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## OTP Activated; Mansur Seen as Deputy

WASHINGTON, D.C. – President Nixon has signed the Executive Order formalizing the Office of Telecommunications Policy (OTP), which was added to the Executive Offices in a reorganization plan earlier this year.

At the same time, the President announced that he expects to nominate Dr. George F. Mansur Jr. as deputy director of OTP.

Mansur will serve under Dr. Clay T. Whitehead, whose nomination as director of OTP was confirmed by the Senate during the summer [CW, July 29]. Whitehead's swearing-in is expected shortly, now that the executive order has been signed.

OTP functions spelled out in the executive order closely parallel those anticipated by the fact sheets distributed when the office was first proposed. Of particular interest to computer users, the order provides that the director of the office shall: Conduct studies and analyses to evaluate the impact of the convergence of computer and communications technologies, and recommend needed actions to the President.

At that same time, the order reiterates the decision-making authority of the FCC: Nothing contained in this order shall be deemed to impair any existing authority of jurisdiction of the Federal Communications Commission. In carrying out his functions under this order, the director shall coordinate his activities as appropriate with the Federal Communications Commission and make appropriate recommendations to it as the regulator of the private sector.

Mansur is 42 and has been with Collins Radio, responsible for projects involving both military and civilian uses of microwaves.

# DP Services by Carriers Still Wrong, Says Adapso

By Don Leavitt
CW Staff Writer

WASHINGTON, D.C. – The Association for Data Processing Service Organizations (Adapso), in oral arguments before the FCC, has repeated its contention that regulated common carriers should be completely prohibited from offering data processing services to the public. The position was presented by a spokesman for Adapso's Computer Timesharing Services Section (CTSS).

Adapso's position was the most strongly worded objection to the tentative decision, handed down in April, under which the FCC ruled that carriers could provide DP services, so long as they were conducted by entities that were legally and financially separated from the carrier operations.

Repeating its written argument against the decision, Adapso said the carriers should concentrate on improving their primary communications operations, instead of trying to "skim the cream" off of other revenue sources.

If allowed, Adapso said, DP services offered by carrier subsidiaries should be regulated. Adapso argued that policing of the carrier subsidiaries to be sure that they actually would be, financially separate from their parent corporation, would require massive effort by the FCC, including the addition of a whole new office within the Common Carrier Bureau.

DP services provided by non-carrier related companies should not be subject to regulation, the Adapso spokesman added.

### Latest Hearings

The latest hearing on the tentative decision was attended by representatives of carriers and independent DP-related groups. Adapso's argument was the one that seemed to draw the most attention from the commissioners.

Western Union repeated its request that it be allowed to sell off-peak or standby capacity of its computers, when available, to any and all users, including the carrier's own affiliates. Stressing the fact that he was talking about computer capacity and not services, a WU spokesman said that only with such a plan could his company get maximum utilization from its CPUs.

In general, the representatives of the other groups that spoke repeated their previously admitted written replies to the tentative decision, agreeing with it.

The FCC is expected to determine whether the tentative ruling will stand, in the near future.

## Communications

## Reactions Generally Approve NAS Report

WASHINGTON, D.C. – Commenting on the National Academy of Sciences' (NAS) report on problems of interconnection of user-owned equipment with the telephone system [CW, July 1], AT&T told the FCC that the "findings and conclusions of the panel regarding tariffs should be accepted by all."

Carterfone Communications Corp. said that the panel did not do the job it was asked to do, and that its report should therefore be rejected.

Carterfone and the carrier are once again on opposite sides of the interconnection issue. The NAS report in fact was commissioned last year to investigate interconnection, a possibility that was brought about by the Carterfone court victory in 1968.

The report concluded that enforced certification of equipment, installation and maintenance of the non-carrier equipment might protect the telephone system.

Most of those who commented on the report agreed that certification was the key to the problem. But the questions of who should establish the certification standards and who should enforce them, evoked a broad range of answers.

AT&T specifically agreed with the NAS conclusion that manufacturers' self-certification would not be adequate.

GT&E Service Corp. felt that interconnection could be speeded by a certification program that was geared to nothing but the interface devices themselves.


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The Measure Men.

# File Formatting Group Meeting Hears From New User

By Allan Drattell
CW Washington Bureau

ARLINGTON, Va. – The File Formatting Systems Commercial Users Group met here last week and heard the experiences of a new user of such a system.

The users group consists of 23 companies and its purpose is to promote the use of data management systems developed by the U.S. Government and to interchange information on these systems.

Carolyn Shanlin, a lead programmer with Radiation Inc. of Melbourne, Fla., told the group that the company found the National Information Processing System (Nips) "well-debugged and tested" and that it "performed the functions of a good information management system well."

Miss Shanlin, in attesting to the capabilities of Nips, told why Radiation first got involved with the File Formatting Systems (FFS). "Due to rapid growth, we experienced accelerated hardware acquisition. Computing requirements were primarily determined by the engineering and scientific needs of our company. Consequently, we were not fully prepared for the arrival of the 360.

"In many cases, wired boards for the 407 were converted to 360 RPG and Cobol programs without redesign. The result was obsolete and inflexible software.

### Monolithic Programs

"Programs were monolithic and files were unstructured," she continued. "Data elements were scattered across many files. Constant changes created patchwork systems that became increasingly more expensive and difficult to change. The payroll/personnel/labor distribution system, for example, contained 78 master files, 190 programs and 90 sorts."

Miss Shanlin explained that because of intricate interfaces, redesign of any one system would still have constraints imposed upon it. "It would be necessary to recycle through complete redesign of each system several times. This seemed impractical with traditional tools."

Radiation began to look toward generalized information management systems as a solution. "Lead time," she explained, "would be shorter due to the less complete definitions required to begin development and the less coding and testing required.

Systems could later be changed easily and conveniently. Consolidated and structured data bases would simplify and reduce the number of programs."

A pilot data base – a personnel system – was chosen as part of the evaluation of the capabilities of Nips. "The results of our evaluation," said Miss Shanlin, "were that Nips was an outstanding data management system. It met our expectations and, in some cases, exceeded them. Machine time requirements proved to be less than we had anticipated and improvement in documentation of programs as well as a reduction in the need for it was an unexpected benefit."

Limitations of Nips included no ability for crossfile editing, reloading changed tables in their entirety, and logical relationships between records cannot be defined.

The personnel/payroll/labor distribution system, under development utilizing Nips, is scheduled for completion in March.

### 2 FFS Systems

There are at least two systems called FFS, according to user group chairman James J. Perry, director of marketing services for Krall-McIlvain Information Inc., a consulting firm in Paoli, Pa.

One FFS, Nips, was produced under the auspices of the Defense Communications Agency (DCA) and is currently the only one released to commercial users. Development cost of this system was at least $3 million, Perry added.

The other FFS is from the Defense Intelligence Agency (DIA) and will not be released to commercial users until February 1971. Both the DIA and DCA systems have generally the same capabilities. One of the big differences is that the DIA system is programmed almost completely in Cobol, which means it will have machine transferability. The DCA system is partially in Cobol and partially in Assembly Language.

FFS packages are run on 360/40s and up with a minimum core of 28K under OS environment, either PCP, MFT2 or MBT.

"As a tool," said Perry, "FFS enables you to cut programming costs. It can provide reports with a significant cost reduction – about 25% to 80%."

## Societies

# New Electronics Show In Planning Stages

CW Washington Bureau

CHICAGO – A new computer show, aimed at users, is in the planning stages.

The National Electronics Conference (NEC) will manage and sponsor a new series of computer shows for the Midwest region, to be held in Chicago each June through 1975.

The first outing, June 7-9, 1971, is the Computer Forum and Exposition (Comfor/71). This one, like future shows, will be held at the newly rebuilt McCormick Place.

According to Rudolph J. Napolitan, general manager, NEC, the organization conducted a study and determined that there would be no major computer shows in the Midwest region in the next five years.

NEC has sponsored electronics shows in Chicago each year, and last December's, held in the Conrad Hilton Hotel, attracted 18,000. NEC is a non-profit organization sponsored by 13 Midwestern universities.

# ACM Names Smith Executive Director

NEW YORK – F. Gordon Smith has been appointed permanent executive director of the ACM.

Smith has been acting executive director since July 1, replacing J. Don Madden. His selection by the ACM Council was made during the recent ACM '70 Conference in New York.


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## New Showplace

# LSI Memories Making a Splash in Semiconductor Field

By E. Drake Lundell Jr.
CW Computer Industry Editor

While semiconductor memory manufacturers drive to capture a larger share of the memory market from the well-entrenched core, there is still a great deal of debate within the semiconductor ranks over the various large-scale integration (LSI) approaches.

In fact, "semiconductor memory technology is becoming the showplace and proving-ground for new LSI approaches," according to Andrew C. Tickle of Zeion Inc. in Canoga Park, Calif.

At a recent debate over LSI memories Tickle said: "Apart from the large market, the high-density and relatively simple logical organization of memories make them ideal for demonstrating new process, design and manufacturing techniques."

D. Frohman-Bentchkowsky of Intel Corp. declares that the lowest costs in the semiconductor memory field are projected for MOS memories and predicts that by 1972 most semiconductor memories will have a high-volume price that is lower than that of magnetic core memories.

The Intel researcher said that for MOS memories to meet the cost projections "a high yield MOS (metallic oxide silicon) technology is required" and he added that the silicon gate technology offers considerable advantages in reaching the low-cost goal when compared to other MOS technologies.

### Breaking Barrier

By using this process, silicon gate dynamic MOS memories will be breaking the one cent price barrier at about the same time that bipolar semiconductor memories are breaking the 10 cent price level, he declared.

However, he indicated that "in fairness to bipolar memories, it should be noted that performance dimension is not reflected in this comparison. While the dynamic MOS RAMs random access memories have access times of less than 500 nsec, the bipolar RAMs have access times of less than 100 nsec."

J. J. Kubinec of Computer Microtechnology, Inc., however, claimed that the aluminum beam lead multichip memory modules offer significant advantages in three areas.

First, he said, this technology allows low power MOS storage to be combined with high-performance bipolar decoding and sensing, which is easily interfaced with computer systems.

### Lower Cost

Secondly, the technique would result in lower cost in that fewer and simpler interconnection including aluminum ultrasonic bonds are amortized over more bits of memory.

Finally, he stated that there was increased reliability in that aluminum-to-aluminum bonds could be made with no intermatallics, one bond per lead, no die attach, and fewer interconnects in the final systems both of the bond type of the soldered printed circuit board type.

Tickle said that "the fastest RAMs are still expected to be bipolar, but are unlikely to challenge MOS techniques on density or power."

Standby power and the risk of its interruption are still major problems with semiconductor RAMs on the market today, he said, but the "silicon nitride memory is the main hope for non-volatile systems. Because of the larger number of voltage levels, and process compatibility problems, it will emerge at first as a hybrid system," he noted.

# Sales of DP Equipment in West Germany Expected to More Than Double by 1974

WASHINGTON, D.C. — Sales of computer equipment in West Germany are expected to more than double from the $473 million registered in 1969 to more than $1 billion by 1974, according to projections made by the U.S. Department of Commerce's Bureau of International Commerce.

At present, the department reports, American manufacturers account for 25% of the equipment sold in Germany. The Bureau also announced that it will sponsor a trade show in Frankfurt Feb. 15-19 in order to help American firms up their market share.

### Sixth Exhibition

This will be the sixth exhibition of electronic data processing equipment in the Frankfurt Trade Center since June 1964. American manufacturers participating in the first four shows reported first-year sales totaling $7.4 million.

The .42 U.S. companies that exhibited their products in the fifth show recorded immediate sales of $1,035,000 and estimated that first-year sales could exceed $19 million.

Exports of U.S. equipment to the Federal Republic of Germany almost tripled between 1966 and 1969. In 1967 almost $70.8 million of this type of equipment imported by Germany came from the U.S. This total increased to $116.9 million in 1969.

Market research conducted for the department discloses that the number of installed computers in Germany is the highest in Europe and second only to the U.S.

But the studies also reveal the Federal Republic trails four of its European neighbors in computer density ratio. Switzerland leads European nations with 205 computers per million workers, and Germany is in fifth place with 134 computers per million workers.

### 1969 Operations

The market research shows that approximately 6,400 computers were in operation in Germany in 1969. Installations this year are expected to boost the total to 8,000, and 20,000 are expected to be in operation in 1976.

The demand for small computers carrying an average monthly rental rate of under $2,000 is expected to grow from the 1,480 in operation in 1969 to an estimated 6,000 in 1974.

# Varian Expands Series Of Maintenance Contracts

IRVINE, Calif. – Varian Data Machines has announced a new, expanded series of maintenance contracts available to both new and existing customers.

The six separate plans allow the customer to tailor his maintenance to his exact requirements. For example, the on-site plan provides for full-time services of a customer engineer. Complete maintenance and all replacement parts for the computer and all peripheral devices are included. The price of this plan begins at $3,200/man/mo.

The full-service plan provides "on-call" maintenance including parts on the entire system. Monthly prices, depending on the computer system, start as low as $80.

The limited-service plan provides the same coverage as the full-service plan except that replacement parts for peripheral devices are not included. Prices are commensurately lower.

Three completely new plans are also available. All are based on total service calls regardless of system size or complexity.

The twelve-twelve plan provides 12 scheduled preventive maintenance service calls and 12 corrective service calls on an "on-call" basis. Replacement parts in the computer, computer options, and controller cards are included. Annual costs for this plan average $250/mo.

The twelve-six plan is the same as the above plan except that six corrective service calls are provided. This plan is available on an annual basis at only $200/mo.

The six-six plan is the most economical service contract available. Six scheduled preventive maintenance and six "on-call" corrective service calls are provided. As in the twelve-twelve plan, replacement parts are included. Yearly charges for this plan are only $140/mo.

# Honeywell Adds Integrated Circuit Low-Cost Memory

FRAMINGHAM, Mass. – Honeywell has added a "midget" 1,000-word integrated circuit magnetic core memory system, marking the fifth addition to its compatible ICM series.

Measuring about 9 in. by 4 in. by 1 in., the ICM-100 is organized in 8-, 9- and 10-bit formats to handle various combinations of read, write, restore, modify and clear functions in minicomputer-based random access systems. It operates at a 1 µsec full cycle time with an access time of 310 nsec. Data also may be destructively read out of memory at 500 nsec rates.

### Magnetic Core Array

The ICM-100 uses a 3-wire, 3D, coincident current magnetic core array. However, all logic, addressing, data buffering, control, selection, switching and sensing functions are performed by monolithic integrated circuits. It is compatible with all DTL/TTL.

The ICM-100, which is the smallest in Honeywell's family of ICM memory systems, is priced from $595/unit in quantities. Deliveries will begin immediately on a 30-day basis.

# Class of Bistable Devices Developed for Memories

YORKTOWN, N.Y. – A new experimental class of two-terminal bistable devices with "attractive features" for switching and memory purposes has been developed at IBM Research Division.

The devices have desirable characteristics in terms of speed, as well as of voltage and current requirements, the firm said, adding that a feature desirable for memory applications is their relative non-volatility.

Although one of the states (the low-impedance one) is thermodynamically "unstable," at zero bias this state persists for as long as three weeks at room temperature. Moreover, the devices are formed from well-understood crystalline materials similar to those used for transistors, in contrast to bistable devices formed of amorphous or glassy materials.

The devices are "heterojunctions," formed by epitaxial contact of two different semiconductor materials. They are fast-switching from an inherently high-impedance state to a low-impedance state in about 100 nsec; switching in the reverse direction takes about 10 nsec. The energy required to do this is about $10^{-13}$ joules in both directions. The glass switches require at least a thousand times more. Thus far, n-type zinc selenide in contact with p-type germanium has received the most attention, but similar switching behavior in a number of other combinations has also been noted.

Switching to the low-impedance state is accomplished by reverse-biasing, typically at values of a volt or two. Switching to the high-impedance state is carried out by applying up to a few milliamperes of current in the forward direction.

# Ontario Facility Reports Minimal PDP-5 Downtime

CHALK RIVER, Ont., Can. – One of the industry's first small computers has completed 44,000 hours of virtually continuous operation with practically no downtime. The computer, Digital Equipment Corp. PDP-5, is installed at the Chalk River facility of Atomic Energy of Canada Ltd.

The PDP-5 was used in the configuration of the prototype pulse height analyzer employed at Chalk River. Since that time, the facility has produced many pulse height analyzers using later model DEC computers.

Installed in 1964, at the laboratories' research chemistry branch, the computer system performs work formerly done by fixed wire pulse height analyzers.

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A formatting device, for instance, makes for fast, efficient data entry. The computer displays a form of fixed data. You fill in the blanks with variable data.

A look-ahead feature saves transmission time. It scans ahead and if there is no data on the rest of a line, the cursor goes directly to the next line. Which beats transmitting a lot of blanks.

Another point. You can use Consul in any of three modes—page, message and conversational. In the page and message modes, you can edit a whole or a partial-page of data before transmission. In the conversational mode, data simultaneously appears on the screen as it is transmitted. Also, you can correct mistakes in this mode without retyping the whole line.

Several other details. The terminal has a 12" TV monitor. It has a built-in modem (optional) that can operate as an acoustic coupler as well as via hardwire connection to a DAA. It has hard copy, cassette and graphics capabilities available as options.

Consul is available in three models. The Consul-800 displays 512 characters; the 840 displays 1,024; the 880 displays 1920 characters. They cost respectively $2995, $3495 and $3995. Pretty reasonable considering the equipment.

But, then, there are a lot of new terminals on the market. And there have been a lot of claims. The only way to judge a terminal is to see it working.

**We'll be glad to demonstrate the Consul in your office or ours; the Envoy anywhere there's a phone and an outlet.**

**ADDS**
Applied Digital Data Systems Inc.

Mr. Richard Kaufman, Dept. 40
Applied Digital Data Systems, Inc.
100 Marcus Blvd., Hauppauge, N.Y. 11787 (516) 231-5400

☐ Please send me a brochure on the Envoy.

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## Change in Strategy

# RCA Family Aims at IBM Users for Second Position

MARLBORO, Mass. – RCA is gearing all of its marketing efforts for its new RCA 2, 3, 6, and 7 computers [see story on Page 1] directly at the present users of the IBM 360/30, 40 or 50 systems.

And the firm predicts that its new marketing strategy will make it number two in the computer business to IBM domestically in the 1970s with an annual volume of over $1 billion per year.

Both the evolutionary nature of the new systems and their compatibility with existing RCA and IBM lines indicate this marketing decision.

Perhaps more significantly, however, the new guaranteed conversion system [see Page 4] for IBM 360/30, 40, and 50 users even more clearly spell out the new direction for RCA.

And, according to Chairman and President Robert W. Sarnoff, "These two innovations are the latest – but by no means final – steps in our program to achieve a billion-dollar volume and corresponding profit for RCA in the computer market by the late 1970s."

### Strategy Outlined

Former IBMer L.E. Donegan Jr., now division vice-president and general manager, RCA Computer Systems Division, said that all four computers are compatible with existing RCA and IBM equipment and he claimed that they offer all users of IBM System 360/30, 40, and 50 class computers considerably greater memory capacity and performance than their present equipment at little or no increase in cost.

"Since users of these machines constitute more than 50% of all installed third generation computer equipment, we are, in effect, offering a majority of existing computer users a new line of equipment that will enable them to perform more work, faster and more efficiently, at little more than they are paying for their current computers," he added.

Donegan said that under RCA's new contract option, known as "guaranteed conversion," a customer who leases or buys one of the new systems would enter into a contract with RCA guaranteeing successful conversion of his existing system programs on the basis of mutually agreed upon time and performance specifications.

Because the concept is an entirely new one, he added, it will be limited initially to present IBM 360/30, 40, and 50 installations operating under IBM's disk operating system.

Donegan pointed out, however, that this covers more than 50% of existing IBM third-generation computer installations, and that it represents only the initial step in the guaranteed conversion program.

Donegan claimed that RCA studies indicate that many of the present 40- and 50 users are presently operating at maximum core memory and that they have not had a choice in upgrading except to go to the more expensive IBM 370 series until the RCA announcement.

The new RCA systems, he said, "do not compete at all with IBM's new 370/165 and only to a very minor degree with IBM's 370/155."

"They do offer, however, to all users of IBM 360/30, 40, and 50 class third-generation computers, considerably greater memory capacity and performance than their present equipment at little, or no, increase in cost."

### Business Discussed

Sarnoff also discussed the present state of RCA's computer business at the introduction of the new systems.

"Our computer bookings for the first six months of this year exceeded the same period last year by more than 20%. This puts us, I believe, among a very select few in the industry," he claimed.

"Computer shipments in the first half of this year were also up considerably – more than double the same period last year. We also show a sharp increase this year in new accounts – customers coming to RCA for the first time. During this period our total of new computer accounts was six times greater than in the comparable period of 1969," Sarnoff said.

"All of our plans and projections are geared to an expected industry growth rate greater than that of any other major segment of the economy. Today, approximately $20 billion worth of systems are installed and operating, and industry shipments this year are estimated at $3.2 billion. Over the next five years, the installed base is expected to double, and shipments to rise to an annual level of $6.4 billion.

"The bulk of this market – more than 80% – is in systems ranging in monthly rental from $5,000 to $100,000. Here is where we are concentrating RCA's efforts, with particular emphasis upon the $15,000 to $50,000 category, which accounts for the largest present and prospective share of the business," Sarnoff continued.

### Number Two Seen

"I have said before that we intend to achieve a firm number two position in the domestic market," Sarnoff continued. "Recently, as you know, the industry pattern has been altered by Honeywell's acquisition of General Electric's computer operations. Naturally, this introduces a new and hotly competitive element into the race.

"Nevertheless, let me say again, that we are still determined to attain an industry rank second only to IBM in this country. In order to accomplish this goal, RCA is prepared to commit whatever resources are necessary."

# American Companies See New Horizons In U.S.-Sponsored Trade Shows Abroad

By Alan Drattell
CW Washington Bureau

WASHINGTON, D.C. – What is the value of trade shows overseas sponsored by the U.S. Department of Commerce?

What these shows can mean to the small computer companies was underscored by James H. Lefeaver, special assistant to the director, commercial exhibits program, when he cited the case of an unnamed California company which, after displaying its wares in a trade show, increased its overseas sales from zero to 28% in 18 months.

Lefeaver emphasized that the current economic climate in the U.S. makes it more imperative for American companies to build bridges abroad. And a number of companies support his contention.

For example, last April at IBM's annual meeting, board chairman Thomas J. Watson Jr. said that foreign computer business for the company is offsetting a decline in domestic sales. Computest Corp., Cherry Hill, N.J., said recently that overseas markets account for 40% of its sales for the current calendar year.

Add to these testimonials the fact that Commerce's Computer Solo Exhibition and Conference scheduled for Tokyo's Harumi Pier Oct. 12-17 is a sellout. Some 49 American companies – from Control Data and Univac to Data Pathing and Inmec – will be showing their wares.

In addition, the Association for Computing Machinery is sponsoring a conference to be run with the exhibition. It will cover such topics as interactive and interconnecting computer systems, systems standards, management systems, terminals, and mini-computers.

The success of these trade shows can further be delineated by the conclave held in Sydney, Aus., earlier this summer. The shows are "selling shows," Lefeaver said. At the Sydney outing, floor sales of American data communications and graphic data systems displayed by 24 U.S. companies passed the $1 million mark. Prospects for these firms over the next year to two years are estimated at reaching $31.1 million.

About 6,000 to 8,000 attendees are expected at the Tokyo show, and Lefeaver explained that the individuals who will be there will be those who can make buy-or-no-buy decisions. "Before we schedule a show for a particular area we do a thorough market research program," he said. "We make up to 500 personal calls to firms in the particular area and when U.S. companies get ready to exhibit we provide them with a comprehensive list of contacts interested in specific products and specific exhibitors."

Lefeaver added that for every appropriated dollar spent, Commerce's overseas exhibits program returns $15 in imports to the U.S.

Future computer trade shows sponsored by Commerce include terminals in Milan, Italy, Nov. 20-26; minicomputing equipment at the London Trade Center, Jan 25-29; and display equipment at the Frankfurt, West Germany, Trade Center, Feb. 1-19. For further information about these shows, contact the Department of Commerce in Washington, D.C.

Tape Drive Tester

# Ampex TDX Exerciser Can Test Memory Systems

CULVER CITY, Calif. – A portable device for exercising and testing Ampex Model TMX and TMZ tape memory systems has been placed on the market by Ampex Corp.

Eugene E. Prince, vice-president/general manager of the Ampex computer products division, said the new Model TDX exerciser checks out data electronics and transport capabilities of the tape memories.

The unit weighs less than 12 lbs. and is priced under $1,000 in production quantities. It is available immediately.

The portable TDX enables original equipment manufacturers who purchase the Ampex tape drives to test them quickly and at low cost, Ampex claimed.

The exerciser checks tape motion by simulating controller commands and the unit's response. It also reads and writes data in selectable patterns.

Prince said the TDX has been used successfully at the Ampex manufacturing plant here and at field service centers. "Since early this year, we have used the TDX for final testing of TMXs and TMZs prior to shipping," he said. "Also, our field service teams have added the TDX to their maintenance kits."

# Mini Makes Right Moves In 1st DP Chess Tourney

NEW YORK – A mini has beaten most of the big boys at chess and placed second in the First U.S. Computer Chess Championship, played at ACM '70.

Undefeated and winner of the championship was a CDC 6400 programmed at Northwestern. But a Varian Data 620/i with only 4K of memory came in second.

Six teams competed in the tournament, all but the Varian team using computers at remote sites. Four used direct Teletype communication, and one used a telephone to call a team member at the computer center.

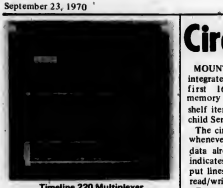
Line problems and system crashes were common, frequently causing delays. One game was forfeited when the team was unable to get its program loaded properly on a Burroughs 5500.

To the casual observer, the biggest difference between the computer tourney and one between human players was the noise level. Normally chess tournaments are conducted in absolute quiet. Here, good moves were greeted by silence but poor moves were greeted by catcalls and derisive comments.

### End Games Weak

And there were poor moves. The tournament amply demonstrated that computers do not yet play chess as well as humans. "A serious weakness in nearly all of the programs is the end game," commented Tournament Director Dr. Jacques Dutka.

An example of this was the game between programs written by Dennis Cooper and Hans Berlinger, which ended in a draw after both computers repeated the same moves three times. With human players, the game would not have ended that way, Dutka said.



Timeline 220 Multiplexer

# Multiplexer May Have Lowest Cost/Channel

PENNSAUKEN, N.J. – A time-division multiplexer available from Infotron Systems Corp. is claimed to have the lowest cost per channel in the industry.

Called the Timeline 220 Multiplexer, it features a flexible speedmixing capability that is said to provide more mixed speed channels than any competitive device. According to Infotron, it is the only multiplexer available that can operate as either a character multiplexer, a bit-interleaved multiplexer, or both, simultaneously.

Efficiency in the utilization of high-speed line bandwidth is another plus claimed by the company. The bandwidth is determined by the aggregate of the channel speeds in use.

A built-in diagnostic panel is designed, Infotron said, to permit the user to quickly pinpoint the source of a problem in any part of the total communications network.

The multiplexer enables data to be transmitted simultaneously from multiple, low-speed terminals over a single, leased telephone line. Capacities of 56/110, 43/135, 38/150, or 19/300 bit/sec channels are said to permit the user to buy only the configuration he needs with the option of adding channels as he increases his requirements.

Other Timeline 220 options include throughputting or channel adding – the ability to add low-speed channels at any intermediate point on a point-to-point-to-point configuration, and collecting – the ability to collect multiple high speed channels. This collecting can occur, the company said, at a remote site or at the computer.

The cost of the basic Timeline 220 is $4,500. Channels can be added, in groups of four, to a total of 56. The cost per channel is $90. An optional version of the channel, equipped with indicator lamps that are used to show the status of the control signals, is priced at $120/channel.

The Timeline 220 Multiplexer is currently available on a 30-day delivery schedule.

Infotron Systems Corp. is at 7300 N. Crescent Blvd.

# Strip Printer Said To Afford Reliability

PLAINVIEW, N.Y. – A strip printer that is said to afford economy as well as reliability is available from Computer Terminals, Inc.

Described as simple in design, the CTS 444 printer has all logic packaged on a single PCB. The unit prints at an average speed of 35 char/sec using a 64-character set.

The price of the printer is $550 in quantities of one to 10. OEM discounts are available. Evaluations units are available from stock.

Computer Terminals Systems, Inc. is at 52 Newtown Plaza.

# Circuit May Better Associative Memories

MOUNTAIN VIEW, Calif. – A bipolar integrated circuit, that is said to be the first 16-bit random-access associative memory available as a standard off-the-shelf item, has been introduced by Fairchild Semiconductor.

The circuit is designed to signal a match whenever data at its inputs corresponds to data already stored. Each match output indicates a comparison between four input lines and four corresponding bits in a read/write contents addressable memory.

Featuring a 35 nsec maximum match time, the TTL product is said to allow computer designers to achieve high-system speeds for repetitive information while still making use of a slower main core memory.

The MµL4102, according to Fairchild, provides a low-cost method of increasing the speed of data processing similar to the "Cache System" used by the IBM 360/85. In this application, the circuit is connected directly with the 9035 semiconductor random-access memory to reduce total access time to 70 nsec.

The 4102 is organized into four 4-bit words, each with its own address line. When a word is addressed, the contents appear on the four output lines.

Packaged as a dual-in-line unit with 24 pins, the MµL4102 is priced at $50 in quantities of 100 to 999. The price for 1-24 quantities is $75, and $60 at 25-99.

Fairchild Semiconductor is at 313 Fairchild Drive.

# CMC Low-Cost Punched Tape Reader Unit Designed for Direct Mechanical Coupling

CARLSTADT, N.J. Computer Mechanisms Corp. has announced a new low-cost punched tape reader that can be driven by a 15-degree stepper motor.

The CMC Model 18-H Tape Reader is designed for direct mechanical coupling with other equipment. It contains no drive unit but has a shaft that extends from the rear panel for connection to any external drive.

The tape reader features starwheel sensing with speeds up to 120 char/sec. It is capable of reading 5, 6, 7 or 8-channel paper or mylar tape. Ball bearings are utilized on the sprocket shaft to minimize friction and to afford greater loading capacity from the drive connection.

Model 18-H Tape Reader comes mounted on a 2-3/8 in. by 4-1/8 in. panel; other size panels are also available on request. An end-of-tape switch is optional.

Single unit cost is $155 with OEM discounts available.

Computer Mechanisms Corp. is at 493 Washington Ave.


OCTOBER 28th

The Fight for the Market Place

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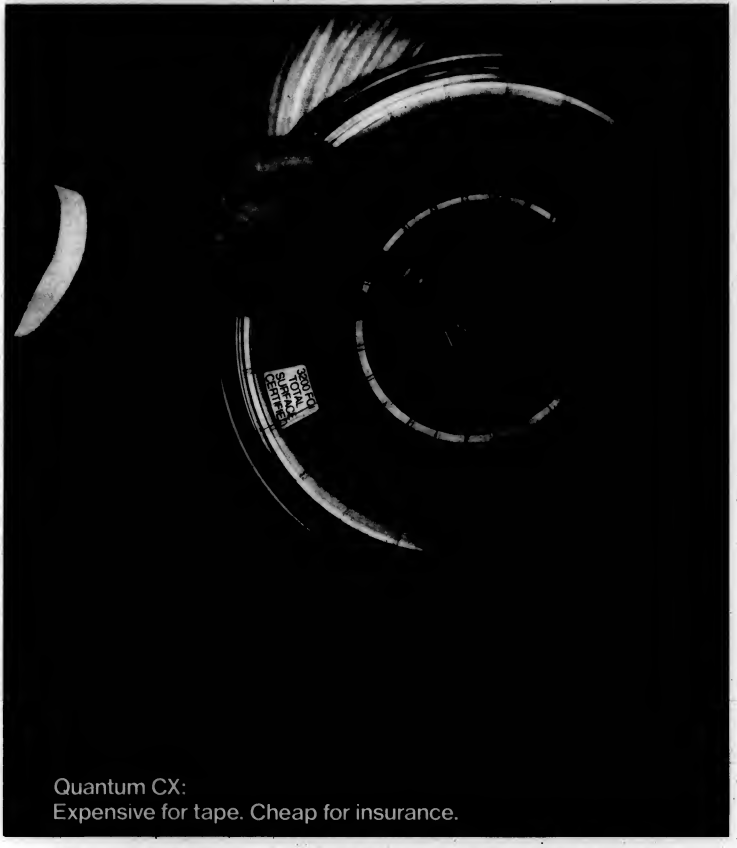


At this very moment, the critical data in your tape files may be deteriorating. Until Memorex Quantum came along, there wasn't much you could do about it.

Now there's Quantum CX. It protects against lost data two ways.

First, with the proven Quantum oxide coating that makes it more resistant to "growing errors" than any other tape. Second, with a new back coating that reduces errors by minimizing debris-attracting static charge. And by preventing back scratches that cause base film debris.

It costs more to make a tape the way Quantum CX is made, so it'll cost you a little more to buy. But remember, the premium you pay really isn't for the tape. It's for the insurance.

For more information on Quantum CX, write: Memorex Corporation, Information Media Group, Memorex Park, Santa Clara, California 95050.

MEMOREX

## Computer Games People Play

DALLAS – If you had $1 million you could show those brokers how to make some money in the stock market, couldn't you? Sure! Well, step right this way, ladies and gentlemen, for only $15 you can have that million (on paper at least) for eight weeks, to put and call and long and short to your heart's content. And when you're all done a little old 360/40 will tell you exactly how much you've won or lost.

A new company, Computer Games, Inc., has developed a computer model of the New York and American exchanges, and is letting anyone with $15 have a whack at it. The model allows for broker's commissions and permits short sales and margin trading as well as leveraging (at 10% interest), and takes into account dividends, stock splits, and rights.

The simulation doesn't calculate taxes, make margin calls, or permit intraday trading – all trades are made at the closing price of the day.

The game works by mail and the date of the postmark is the day the trade takes place.

The game is called Portfolio, and Stephen Wingert, president of Computer Games, says that response to its first run which begins Sept. 28 has been "pretty good."

The game lasts for eight weeks, and even permits players to borrow up to $400,000 on their original $1 million stake – at 10% interest.

Wingert said that market studies of the first players to sign up show that the main purpose is just the fun of playing the market but that many people also say that they are interested in learning how the stock market works as well. The price of the game includes a 12-page rule book explaining long and short sales and other market intricacies.

The president also said he hopes that financial institutions will use his game as a means of testing their portfolio managers.

Computer Games can be reached through P.O. Box 64460, Dallas, Texas 75206.

# Honeywell's Stockholders Approve Formation of HIS

WILMINGTON, Del. – The Honeywell-GE computer merger was approved here Friday at a stockholders meeting by an overwhelming vote. A total of 12.7 million shares were voted in favor of the merger and only 201,000 shares against it. The total number of outstanding shares is 15 million.

The combination of the major computer manufacturing operations will be called Honeywell Information Systems, Inc. (HIS).

So far, HIS management has not decided which items of peripheral equipment will be retained.

The new company will keep the bundled marketing position of both GE and Honeywell.

A HIS spokesman revealed that Honeywell Chairman James H. Binger and President Stephen F. Keating this week are visiting major GE users to assure them of their continued support by the new company.

Chief operating officer of HIS will be C. W. Spangle, while Edward C. Lund will be in charge of U. S. operations and Allan L. Rudell will head up the international group.

A HIS spokesman noted that the new company will have 50,000 employees, split evenly between foreign and U. S., and will operate 19 plants in seven countries.

Combined revenue for the two operations in 1969 was $763 million.

Robert P. Henderson, associate group vice-president and head man for domestic marketing, said that the customer bases of the two companies were complementary and that there had been little headon competition between them.

There has been no attempt so far at rendering the GE and Honeywell computers compatible, and HIS officers indicated that were would be no rush to do so.

Rather, as new products are introduced, they will be compatible in two or three families, maintaining the current dual nature of the company's line.

Only over a period of several years, as current computers are replaced by new HIS products, will there be real compatibility.

The HIS officers also noted that there is no need for compatibility from the largest to the smallest computers in the line.

Spangle will direct the company's worldwide computer operations, from HIS headquarters in Waltham, Mass. He will be supported by a staff of four former General Electric executives and two Honeywell executives. Former GE officials are A. O. Way, vice president-staff; E. R. White, vice president of resource planning and integration; J. L. Ingersoll, controller; and J. B. Stroup, director of communications. Honeywell executives are J. C. Chu, vice president of planning, and H. S. Olsen, director of employee relations.

Spangle said HIS worldwide activities will be divided into two major groups: The U. S. Group, headed by Lund, and the International Group, headed by Rudell, both headquartered in Waltham, Mass.

# Machine-Readable Certificates Suggested With OCR Devices

NEW YORK – A new proposal for machine-readable stock certificates is circulating here for comments from the securities industry.

The new proposals, developed from a study done by the Banking and Securities Industry Committee, recommends the design of a new stock certificate to include information that can be read by optical character recognition (OCR) devices.

A previous group – a committee of the American Bankers Association – has recommended the development of stock certificates in the form of punched cards.

Under the new proposal the present standard 8 in. by 12 in. stock certificate would be expanded to an 8-1/2 in. by 12 in. certificate with the additional 1/2 in. being devoted to standard OCR format.

Under the plan, each stock would be assigned a standard identification number which would be printed in the 1/2 in. space by banknote companies and transfer agents.

Interest in methods to automate the handling of stock certificates has been increasing, because many brokers see automation as a method to keep costs down during slow periods, such as the present, as well as a way to handle the large transaction volumes registered during peak periods.

Comments on the new certificates will be due Oct. 8.

# Amex Communications Network To Serve Brokers Nationwide

NEW YORK – The American Stock Exchange has announced the start of work on an industrywide communications network designed to replace costly systems operated independently by brokers and reduce substantially the estimated $200 million expended annually on industry communications.

As a first step, the Amex communications network (Amcom) is being activated by an Exchange order to AT&T for the installation of New York-Chicago transmission lines. The exchange will lease high-capacity transmission lines for use by member organizations at rates significantly below current costs.

## Finance

Amcom will speed investors' orders to the Amex Trading Floor and carry voice, data, Teletype and facsimile signals for member organizations. The sytem will be able to add such features as the computerized switching of all orders – for the Amex and other designated markets – and for advanced customer-broker services.

Arinc Research Corp., a communications consultant under contract with the Exchange, will design the New York-Chicago network as well as develop procedures for expansion into national network operations.

The Exchange announced it is working with a group of major wire houses on the initial New York-Chicago link which is expected to be on-line in six months. Subsequently, a gradual buildup will expand the system into a coast-to-coast operation. Development will be based upon Amcom experience in operating the New York-Chicago link which also will include intermediate cities.

Ralph S. Saul, Amex president, described the program as a "major step for the securities industry to capture the economies of a common communications system." He called the network a "logical sequel to recent Exchange studies which emphasize the current cost problems of member organizations."

The independent communications systems of up to 10 member organizations, will be tied-in to the New York-Chicago net as soon as the circuitry becomes available. In this procedure, the 10 independent networks will be merged into one large New York-Chicago network. Each member house will have prompt, direct and unimpeded access to the network on an assured private basis, Amex said.

A complete backup transmission setup will provide continuing operation of the network.

Use of the Chicago network will enable the 10 member houses to realize immediate cost savings while system design for the national network is completed.

Data gathered in on-line functioning of the Chicago network – traffic information, load levels, operating hours, circuitry, software and hardware requirements, etc. – will provide the basis for national expansion.

While officials at Arinc estimated that a West Coast tie-in could be accomplished by the close of 1971, no estimates were available as to when Amcom would achieve full coast-to-coast operation. Key cities throughout the nation will be introduced into the national picture on a phased basis in keeping with developments in the initial Chicago link.


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at twenty-two of them

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# Collins Radio Sees Profits Plunge

DALLAS – Collins Radio Co. has reported that its profit for the fiscal year ended July 31 nosedived to $432,000, or 15 cents a share. Earnings for the concern were down from year-earlier figures of $8.9 million, or $3.01 a share.

Having suspended dividend payments of 20 cents a share on its common during the fiscal second period, Collins Radio also had a drop in sales to $349 million from $400 million while order backlogs on July 31 were reported down $13 million from a year before.

Company officials said the drop in results reflects the general "economic reversal as well as major readjustments in government and aerospace procurements.

Collins Radio also said an extensive effort is currently under way to improve profits while reducing cash requirements, hoping to establish a more profitable operation at reduced levels of sales volume.

# Comcet Receives Loan Commitment For $1 Million

ROCKVILLE, Md. – In an effort to satisfy current financial requirements, Comcet Inc., a producer of communications systems, has received a loan commitment for approximately $1 million. The company lost approximately $2,792,300 on revenue of $970,550 for the six months ended June 30 and indicates it will incur a further loss for the third quarter ending September 30.

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## Position Announcements

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We're looking for an ambitious, technically strong, professional to direct activities of a sophisticated Data Center consisting of a third generation computer complex (IBM 360/50 OS) and associated support groups. You must be thoroughly experienced with input/output control and scheduling techniques, and very knowledgeable in technical operations. You must have demonstrated ability to effectively manage and plan Data Center future programs and to supervise up to 100 professional and support personnel. Ideally, you will have worked as manager or assistant manager of a data center.

College degree plus five to seven years' experience in Data Center environments. Salary to $22,000.

This position offers an outstanding opportunity for career growth and increased earnings. Excellent benefit program includes profit-sharing plan.

*Please call Mr. Robert Kleven at (617) 861-1020. Or rush your resume to Mr. Kleven at Norton, Kleven and Co. Inc., One Wallis Court, Lexington, Massachusetts 02173.*

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EUROPE TODAY

Issue 16. A ménage à trois in Europe for CDC, ICL and CII -- after months of saying we're only good friends, ICL (UK) and CII (France) admit to a serious flirtation but CII, with typical French coquetry, is also holding hands with CDC. EDP Europa Report examines the affair and the same issue takes a brief look at the Danish market.

Order your copy of EDP Europa Report Issue 16 now, at the non-subscriber price of $5, £1.75 (£1. 15s) USA, $3.35, £1.40 (£1. 8s) Europe, and have its full value accredited to an annual subscription for 24 issues $65, £27 if taken up within two months. Orders may be placed at either of the following offices.

EDP europa report
DEPT.C1.60 AUSTIN STREET NEWTONVILLE MASSACHUSETTS 02160 U.S.A.
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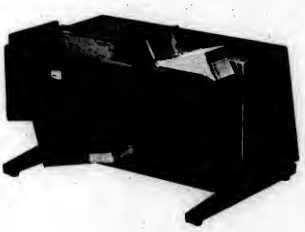
It reads 300 cards per minute, is dirt cheap, remarkably dependable, easy to maintain, and has interfacing for everything but the air-conditioner.



It's the sort of thing you'd expect from the people who call themselves "the mini-peripheral company."

So is our 600 card-per-minute reader. Like the C300 shown here, it's designed to be reliable. When it does need service, just about anybody can do it (although we'll probably volunteer).

Both are made in rack-mount and table-top models, and with our interfaces, are plug-compatible with almost any system on the market.

They can save you an awful lot of time, trouble, and most important, money.

We'll start you off with a production unit to prove it. Just ask.

#2
Peripheral Dynamics Inc.
1030 W. Germantown Pike / Norristown, Pa. 19401
I'm asking. Let's have a look at the:
C300 ☐ C600 ☐
NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

PERIPHERAL DYNAMICS INC.
the mini-peripheral company
1030 W. Germantown Pike / Norristown, Pa. 19401 / (215) 539-8600

TRADE * QUOTES

# Computerworld Stock Trading Summary

All statistics compiled, computed and formatted by TRADE*QUOTES Division of National Information Services, Inc. Cambridge, Mass. 02139

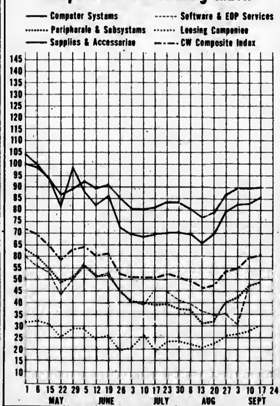
CLOSINO PRICES THURSOAY, SEPTEMBER 17, 1870

| EXCH | | 1970 RANOE (1) | CLOSE SEP 17 1870 | WEEX NET CHNGE | WEEX PCT CHNOE |
|---|---|---|---|---|---|
| | **SOFTWARE & EOP SERVICES** | | | | |
| O | AOVANCEO COMP TECH | 1- 8 | 3 1/4 | - 1/4 | -7.1 |
| A | APPLIEO OATA RES. | 4- 24 | 5 7/8 | - 1/8 | -2.0 |
| O | APPLIEO LOOIC | 2- 18 | 2 1/2 | - 1/2 | -10.8 |
| O | ARIES | 1- 8 | 1 1/4 | - 1/8 | -8.0 |
| A | AUTOMATIC OATA PROC | 23- 47 | 38 3/4 | +3 3/8 | +8.5 |
| O | AUTO SCIENCES | 3- 14 | 4 1/2 | + 1/2 | +12.5 |
| O | 8RANOON APPLIEO SYS | 1- 9 | 1 1/2 | + 1/2 | +50.0 |
| O | COMPUTER AOE INOUS. | 1- 3 | 1 7/8 | + 1/8 | +7.1 |
| A | COMPUTER APPL | 2- 12 | 2 1/4 | - 1/8 | -5.2 |
| O | COMPUTER ENVIRON | 3- 14 | 2 3/4 | - 1/4 | -8.3 |
| O | COMPUTER INOUS. | 2- 10 | 3 | 0 | 0.0 |
| O | COMPUTER NETWORK | 3- 14 | 3 | - 1/4 | -4.7 |
| O | COMPUTER PROPERTY | 5- 15 | 8 1/4 | + 1/4 | +4.1 |
| N | COMPUTER SCIENCES | 8- 34 | 13 5/8 | + 3/4 | +5.8 |
| O | COMPUTER USAOE | 2- 8 | 4 | + 7/8 | +28.0 |
| A | COMPUTINO & SOFTWARE | 16- 75 | 27 5/8 | +1 5/8 | +8.2 |
| O | COMRESS | 2- 10 | 3 | + 5/8 | +28.3 |
| O | COMSHARE | 3- 15 | 3 1/2 | + 5/8 | +21.7 |
| O | CONSOL. ANAL. CENT. | 1- 3 | 1 1/8 | - 1/8 | -10.0 |
| O | OATA AUTOMATION | 1- 24 | 2 1/2 | - 1/4 | -8.0 |
| O | OATA PACXAOINO | 3- 29 | 7 1/2 | - 1/4 | -3.2 |
| O | OATAMATION SERVICE | 1- 6 | 1 3/8 | + 1/8 | +10.0 |
| O | OATATAO | 5- 8 | 4 3/4 | 0 | 0.0 |
| O | OIOITEK | 2- 5 | 1 3/4 | 0 | 0.0 |
| O | EOP RESOURCES | 5- 13 | 5 1/2 | - 1/4 | -4.3 |
| A | ELECT COMP PROO | 3- 11 | 4 1/4 | + 3/4 | +21.4 |
| O | ELECTRONIC OATA SYS. | 31-101 | 34 1/2 | +3 1/2 | +8.8 |
| O | INFORMATICS | 4- 21 | 8 | - 1/8 | -2.0 |
| A | ITEL | 8- 26 | 13 1/8 | +3 1/8 | +31.2 |
| O | LEVIN-TOWNSENO SERV. | 1- 13 | 4 1/2 | - 1/2 | -10.0 |
| A | MANAOEMENT OATA | 8- 25 | 11 1/4 | + 1/2 | +4.6 |
| O | NAT COMP ANALYSTS | 1- 8 | 3 1/8 | - 3/8 | -10.7 |
| O | NAT.COMP. SERV. | 3- 12 | 4 3/4 | 0 | 0.0 |
| N | PLANNINO RESEARCH | 13- 34 | 22 3/8 | + 1/8 | +0.3 |
| O | PROORAMMINO METHOOS | 8- 27 | 13 | - 1/2 | -3.7 |
| O | PROORAMMINO & SYS | 2- 3 | 2 1/2 | - 3/8 | -13.0 |
| O | PROORAMMING SCIENCES | 2- 33 | 2 3/8 | - 1/8 | -3.0 |
| N | SCIENTIFIC RESOURCES | 2- 22 | 3 1/8 | - 1/8 | -3.8 |
| O | SOFTWARE SYSTEMS | 1- 2 | 1/2 | - 1/8 | -20.0 |
| O | TOS COMPUTER CENTERS | 5- 27 | 8 | +1 1/2 | +33.3 |
| O | UNITEO OATA CENTER | 2- 4 | 2 3/4 | + 1/8 | +4.7 |
| N | UNIVERSITY COMPUTINO | 14- 99 | 20 1/8 | + 3/8 | +1.4 |
| A | URS SYSTEMS | 5- 21 | 6 3/4 | - 1/4 | -3.5 |
| O | U.S. TIME SHARINO | 3- 14 | 5 1/2 | + 1/4 | +4.7 |
| | **PERIPHERALS & SU8SYSTEMS** | | | | |
| N | AOORESSOGRAPH-MULT | 21- 82 | 35 3/4 | +4 3/8 | +13.8 |
| O | ALPHANUMERIC | 2- 15 | 3 | 0 | 0.0 |
| N | AMPEX CORP | 13- 48 | 18 3/4 | + 1/4 | +1.3 |
| A | ASTROOATA | 4- 34 | 8 1/2 | - 5/8 | -8.7 |
| O | OOLT,OERANEX & NEW | 3- 11 | 7 1/2 | - 1/8 | -1.6 |
| N | 6UNKER-RAMO | 8- 14 | 8 5/8 | - 1/8 | -1.4 |
| A | CALCOMP | 11- 33 | 18 3/8 | +2 3/8 | +14.8 |
| O | COGNITRONICS | 3- 13 | 4 3/8 | + 1/2 | +12.8 |
| O | COLORAOO INSTRUMENTS | 4- 13 | 7 1/2 | + 1/8 | +1.6 |
| O | COMPUTER COMMUN. | 5- 30 | 8 3/4 | + 1/4 | +2.9 |
| A | COMPUTER EQUIPMENT | 4- 12 | 4 7/8 | 0 | 0.0 |
| A | COMPUTEST | 14- 28 | 16 3/4 | - 3/8 | -2.1 |
| A | OATA PROOUCTS CORP | 5- 20 | 9 1/2 | + 5/8 | +7.0 |
| O | OATA TECHNOLOOY | 4- 23 | 4 1/2 | - 1/2 | -10.0 |
| O | OIOITRONICS | 4- 13 | 4 3/4 | - 1/4 | -5.0 |
| N | ELECTRONIC M & M | 7- 40 | 11 3/4 | - 1/2 | -4.0 |
| O | FAORI-TEX | 3- 8 | 4 3/8 | + 1/2 | +12.9 |
| O | FARRINGTON MFG | 2- 17 | 4 1/4 | +1 3/4 | +70.0 |
| O | INFORMATION OISPLAYS | 5- 20 | 4 3/4 | - 1/4 | -5.0 |
| A | MARSHALL INOUSTRIES | 14- 87 | 25 1/4 | +3 1/8 | +14.1 |
| A | MILOO ELECTRONICS | 15- 42 | 27 3/4 | +2 5/8 | +10.4 |
| N | MOHAWX OATA SCI | 19- 87 | 33 5/8 | - 1/2 | -1.4 |
| O | OPTICAL SCANNING | 11- 32 | 19 1/2 | -2 | -9.3 |
| O | PHOTON | 4- 17 | 9 1/8 | - 1/2 | -5.1 |
| O | PHOTO-MAONETIC SYS. | 1- 4 | 1 1/4 | 0 | 0.0 |
| A | POTTER INSTRUMENT | 15- 42 | 23 1/8 | +1 5/8 | +8.8 |
| O | PRECISION INST. | 6- 23 | 8 1/2 | + 1/2 | +8.2 |
| O | RECOONITION EQUIP | 13- 83 | 18 | - 3/4 | -3.7 |
| O | REOCOR CORP. | 4- 34 | 6 3/4 | - 7/8 | -11.4 |
| N | SANOERS ASSOCIATES | 7- 29 | 12 1/8 | - 5/8 | -4.9 |
| O | SCAN OATA | 6- 33 | 8 | +1 1/2 | +23.0 |
| O | TALLY CORP. | 10- 23 | 14 | 0 | 0.0 |
| N | TELEX | 10- 25 | 17 3/4 | +2 7/8 | +19.3 |
| O | VIATRON | 2- 31 | 8 3/8 | +1 5/8 | +34.2 |
| | **SUPPLIES & ACCESSORIES** | | | | |
| N | AOAMS-MILLIS CORP | 8- 15 | 12 3/4 | + 1/2 | +4.0 |
| O | OALTIMORE OUS FORMS | 10- 21 | 10 1/4 | - 1/2 | -4.0 |
| A | OARRY WRIOHT | 0- 25 | 9 1/2 | - 1/2 | -5.0 |
| A | OATA OOCUMENTS | 15- 35 | 19 | +1 3/8 | +7.8 |
| N | ENNIS 8US. FORMS | 11- 19 | 11 5/8 | - 3/8 | -3.1 |
| O | GRAHAM MAONETICS | 5- 7 | 0 | 0 | 0.0 |
| O | GRAPHIC CONTROLS | 7- 17 | 7 1/8 | + 1/8 | +1.7 |
| N | MEMOREX | 48-188 | 85 1/4 | +7 | +8.9 |
| N | 3M COMPANTY | 71-114 | 88 | + 3/8 | +0.4 |
| O | MOORE 8US. FORMS | 27- 38 | 31 1/4 | - 3/8 | -1.1 |
| N | NASHUA CORP | 21- 43 | 31 3/8 | +1 | +3.2 |
| O | REYNOLOS & REYNOLO | 23- 48 | 31 1/4 | +1 1/4 | +4.1 |
| O | STANOARO REOISTER | 17- 30 | 18 3/4 | - 1/2 | -2.5 |
| N | UARCO | 22- 38 | 27 1/4 | + 1/4 | +0.8 |
| A | WA8ASH MAGNETICS | 7- 30 | 10 3/4 | + 3/8 | +3.8 |
| O | WALLACE 8US FORMS | 25- 41 | 34 1/4 | + 1/4 | +0.7 |

| EXCH | | 1870 RANOE (1) | CLOSE SEP 17 1970 | WEEX NET CHNOE | WEEX PCT CHNOE |
|---|---|---|---|---|---|
| | **COMPUTER SYSTEMS** | | | | |
| N | 8URROUOHS CORP | 78-173 | 108 7/8 | +3 1/2 | +3.3 |
| N | COLLINS RAOIO | 9- 37 | 14 1/8 | + 7/8 | +8.0 |
| N | CONTROL OATA CORP | 30-122 | 43 1/4 | +2 7/8 | +7.1 |
| A | OIOITAL EQUIPMENT | 50-124 | 79 | +5 | +8.7 |
| N | ELECTRONIC ASSOC. | 3- 11 | 5 1/2 | - 1/8 | -2.2 |
| A | ELECTRONIC ENGINEER. | 3- 14 | 4 7/8 | + 1/2 | +11.4 |
| N | FOXOORO | 18- 38 | 23 1/4 | - 7/8 | -3.8 |
| O | OENERAL AUTOMATION | 8- 42 | 11 1/2 | - 1/2 | -4.1 |
| N | OENERAL ELECTRIC | 80- 81 | 81 | +1 | +1.2 |
| N | HEWLETT-PACKARO CO | 19- 43 | 25 1/4 | - 3/4 | -2.8 |
| N | HONEYWELL INC | 85-152 | 88 7/8 | +1 1/8 | +1.2 |
| N | I8M | 223-387 | 276 1/2 | +8 1/4 | +3.0 |
| N | NCR | 30- 80 | 38 1/2 | + 3/4 | +1.8 |
| N | RCA | 18- 34 | 20 1/2 | 0 | 0.0 |
| N | RAYTHEON CO | 10- 33 | 22 3/8 | 0 | 0.0 |
| O | SCI. CONTROL CORP. | 1- 8 | 2 1/2 | + 1/2 | +23.0 |
| N | SPERRY RANO | 18- 40 | 23 7/8 | - 1/4 | -1.0 |
| A | SYSTEMS ENO. LA6S | 10- 48 | 17 1/8 | + 1/2 | +3.0 |
| N | VARIAN ASSOCIATES | 8- 29 | 14 3/4 | -1 3/8 | -8.5 |
| A | WANO LA8S. | 18- 51 | 38 7/8 | +4 1/8 | +12.5 |
| N | XEROX CORP | 86-115 | 79 7/8 | +1 7/8 | +2.4 |
| | **LEASINO COMPANIES** | | | | |
| O | 8OOTHE COMPUTER | 8- 25 | 12 3/4 | + 7/8 | +7.3 |
| O | 8RESNAHAN COMP. | 3- 9 | 4 1/8 | + 1/2 | +13.7 |
| O | COMPUTER EXCHANOE | 2- 8 | 5 1/4 | - 1/8 | -2.3 |
| O | COMPUTER LEASINO | 3- 18 | 3 | 0 | 0.0 |
| N | OATA PROC. F & O | 8- 32 | 14 1/8 | +1 1/2 | +11.8 |
| O | OATRONIC RENTAL | 2- 8 | 2 1/2 | 0 | 0.0 |
| A | OEARBORN COMPUTER | 10- 24 | 18 1/2 | - 1/4 | -1.3 |
| O | OJEODLO COMP. LEAS. | 2- 8 | 4 3/4 | + 7/8 | +22.5 |
| A | OPA, INC. | 3- 10 | 5 1/2 | +1 1/4 | +29.4 |
| A | ORANITE MGT. | 7- 22 | 13 3/8 | +3 1/4 | +32.0 |
| A | OREYHOUNO COMPUTER | 5- 44 | 8 1/2 | - 3/8 | -4.2 |
| N | LEASCO OATA PROC. | 7- 30 | 12 1/2 | +1 1/2 | +13.8 |
| O | LECTRO COMP LEAS | 2- 8 | 3 | + 3/4 | +33.3 |
| A | LEVIN-TOWNSENO CMP | 3- 19 | 7 | +1 3/4 | +33.3 |
| O | LMC OATA, INC. | 1- 3 | 1 1/4 | 0 | 0.0 |
| O | MANAOEMENT ASSIST | 1- 4 | 1 3/4 | + 1/8 | +7.8 |
| O | NCC INOUSTRIES | 3- 8 | 4 1/2 | - 3/8 | -7.8 |
| O | SYSTEMS CAPITAL | 1- 8 | 3 1/4 | +1 1/8 | +32.9 |
| N | U.S. LEASING | 3- 19 | 14 1/4 | + 1/2 | +3.6 |

EXCH: N=NEW YORX EXCHANGE; A=AMERICAN EXCHANOE
L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER
O-T-C PRICES ARE 6IO PRICES AS OF 3 P.M. OR LAST 6IO
(1) TO NEAREST OOLLAR

## Computer Stocks Trading Index




BASE FOR EACH TRADING INDEX: 100 as of 3/1/68

## Earnings Reports

**FOXBORO CO.**
Three Months Ended June 30

| | 1970 | 1969 |
|---|---|---|
| Shr Ernd | $.33 | $.28 |
| Revenue | 34,758,000 | 30,802,000 |
| Earnings | 1,355,000 | 1,178,000 |
| 6 Mo Shr | .47 | .36 |
| Revenue | 67,713,000 | 56,809,000 |
| Earnings | 1,957,000 | 1,524,000 |

**CONTROL DATA CORP.**
Three Months Ended June 30

| | 1970 | a1969 |
|---|---|---|
| bShr Ernd | $.17 | $.89 |
| Revenue | 143,807,000 | 141,570,000 |
| Spec Chg | d99,000 | c784,000 |
| fEarnings | 2,738,000 | 13,912,000 |
| b6 Mo Shr | .26 | 1.70 |
| Revenue | 269,346,000 | 273,305,000 |
| Spec Chg | d69,000 | e5,402,000 |
| fEarnings | 4,416,000 | 30,484,000 |

a-Restated. b-Based on income before special charge or credit. c-Tax loss carry-forward credit. d-Reflects a $207,000 loss on sale of certain manufacturing properties, less tax loss carry-forward credits of certain foreign subsidiaries. e-Credit; reflecting a $3.5 million extraordinary credit from Commercial Credit Co. and $1.9 million tax loss carry-forward credit of the parent company. f-Equal to 61 cents a share for the quarter and 25 cents a share for the six months period of 1970 compared with 95 cents a share and $2.08 a share respectively, in like periods of 1969.

**CALIFORNIA COMPUTER PRODS.**
Year Ended June 30

| | a1970 | 1969 |
|---|---|---|
| Shr Ernd | $.35 | b$.43 |
| Revenue | 27,540,000 | 20,474,000 |
| Spec Cred | ..... | c167,700 |
| Earnings | 799,000 | e1,127,850 |

a-Preliminary. b-Based on income before special credit. c-From sale of securities. e-Equal to 50 cents a share.

**INT'L CONTROLS CORP.**
Six Months Ended June 30

| | a1970 | b1969 |
|---|---|---|
| Shr Ernd | $.53 | $.50 |
| cRevenue | 48,300,000 | 53,000,000 |
| eEarnings | 2,000,000 | 1,900,000 |

a-Preliminary; excludes deferred gains from bonds and sale of assets to All American Industires, Inc. b-Restated. c-From continuing operations. e-Includes tax benefits.

**LEVIN—TOWNSEND COMPUTER**
Three Months Ended June 30

| | 1970 | 1969 |
|---|---|---|
| aShr Ernd | $.21 | $.76 |
| bRevenue | 15,712,570 | 16,191,935 |
| Tax Cred | c195,000 | ..... |
| dSpec Chg | 316,613 | 144,873 |
| eEarnings | 591,897 | 2,423,767 |

a-Based on common and common equivalent shares, and on net from continuing operations, before tax credit and special charge. b-From continuing operations. c-From tax loss carry-forward. d-From operations discontinued, to be discontinued and held for sale. e-Equal to 18 cents a share in 1970 and 72 cents in 1969.

**HEWLETT—PACKARD CO.**
Three Months Ended July 31

| | 1970 | 1969 |
|---|---|---|
| Shr Ernd | $.22 | a$.24 |
| Revenue | 88,075,000 | 82,727,000 |
| Earnings | 5,547,000 | 6,126,000 |
| 9 Mo Shr | .68 | a.71 |
| Revenue | 262,144,000 | 234,606,000 |
| Earnings | 17,251,000 | 17,814,000 |

a-Adjusted to reflect a two-for-one stock split in February 1970.

**INFORMATION INT'L INC.**
Year Ended April 30

| | 1970 | 1969 |
|---|---|---|
| Revenue | $1,100,421 | $1,021,425 |
| Loss | 613,654 | 213,393 |

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